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INTRODUCTION

The Chicago Sunshine Project will terminate its activities during August 1956. This bulletin will be the last report of results obtained by the Chicago Laboratory.

All results of Sr^{90} analyses of biological materials, soils, waters and air filters accomplished by the Chicago Sunshine Project, including results for samples assayed by the Nuclear Science and Engineering Corporation, Pittsburgh, Pennsylvania, under subcontract, are reported in the University of Chicago Bulletins No. 11 and No. 12. Bulletin No. 11 includes cumulative results to December 1, 1955. Results obtained since December 1, 1955 are presented in this report. A limited number of analyses of human bone, milk, foreign soil and Antarctic snow core samples, now in progress, will be submitted to the Division of Biology and Medicine, U. S. Atomic Energy Commission in a brief letter report during August 1956.

A detailed discussion of experimental methods, including preliminary processing of samples, chemical procedures and the counting method, has been reported.[1] The report is being further distributed as U. S. Atomic Energy

1. E. A. Martell, The Chicago Sunshine Method; Absolute Assay of Sr^{90} in Biological Materials, Soils, Waters and Air Filters, Enrico Fermi Institute for Nuclear Studies, University of Chicago, May 1956.

Commission publication, AECU-3262. Additional copies will be available from the Office of Technical Services, Department of Commerce, Washington 25, D. C.

The results have been discussed to a considerable extent by W. F. Libby.[2,3]

2. W. F. Libby, "Radioactive Strontium and Radioactive Fallout," Science 123, 657 (1956).

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3. W. F. Libby, "Radioactive Strontium Fallout," Proc. Nat. Acad. Sci. 42, 365 (1956).

Some additional discussion, limited to consideration of new data and to topics treated only briefly elsewhere, is given in the following section.

The data for biological and soil samples presented in this report are presented in units of 1/1000 of the maximum permissible tolerance of Sr^{90} in human bone for an average man of 1000 grams total body content of calcium. Thus, the "Sunshine Unit" is 1/1000 microcuries of Sr^{90} per 1000 grams of calcium or 2.2 disintegrations per minute per gram of calcium. Results for water and air samples are reported in disintegrations per minute of Sr^{90} for convenient reference sample volume.

Samples assayed by the Nuclear Science and Engineering Corporation, Pittsburgh, Pennsylvania, under subcontract, are designated by the letter "P" following the Chicago Laboratory sample number (i.e., CL xxx-P).

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DISCUSSION OF RESULTS

I. Sr^{90} Surface Air Concentration Data

Large air blower samples, collected over the last several years at the Naval Research Laboratory, Washington, D. C. by I. H. Blifford and associates, were made available to us for Sr^{90} assay. Collections were made on Army Chemical Corps Type V filters of 200 square inches area and of heavy asbestos fiber composition. Collection volumes ranged from about 1 to 5 million cubic feet of air for collection periods of one day to one week. The large blower samples which were analyzed from Sr^{90} were collected from four locations: Washington, D. C.; Kodiak, Alaska; Port Lyautey, French Morocco; and Yokosuka, Japan. A summary of the Sr^{90} concentration data, together with the location, collection period and sample volume for each sample, is presented in the last section of this report.

The Washington, D. C. Sr^{90} air concentration data are presented in Figure 1. For these samples, the volumes were computed from recorded flow rate data. Figure 2 shows the variation in total flow with length of the collection due to dust loading of filters at the Washington, D. C. station. This curve was obtained from Mr. Blifford at the Naval Research Laboratory, who indicated quite large variations of individual collection volumes from the average values shown.

The data for the three foreign stations are presented in Figure 3. For these, the collection volumes were not monitored and the volume of each sample was estimated by assuming the effect of dust loading observed at Washington, D.C. (Figure 2) applied equally well at these other locations. The necessity of making this assumption imposes a restriction on comparison of relative air concentrations for the four locations but does allow us to consider the change in air concentration with time at each location.

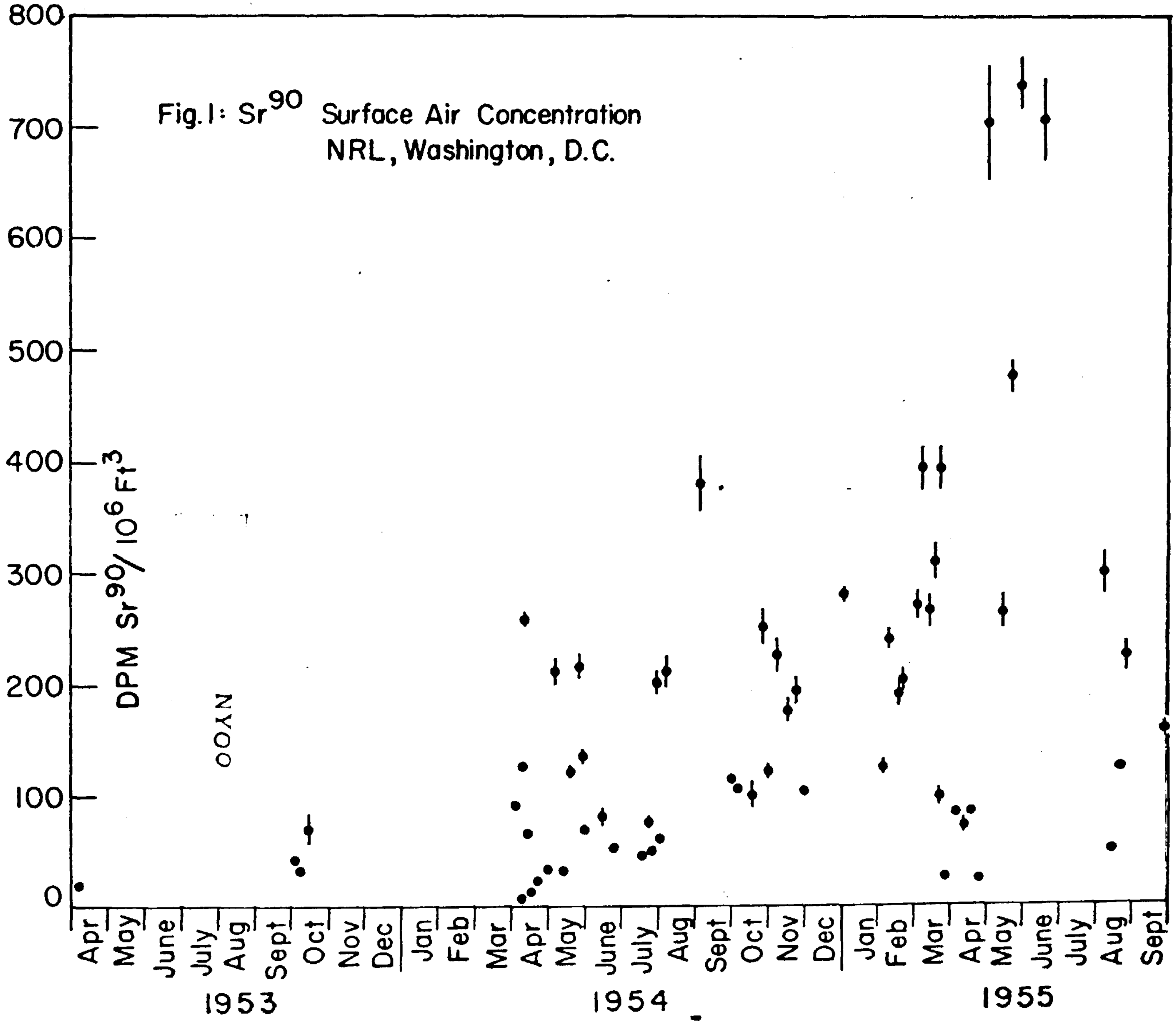

Fig. 1: Sr90 Surface Air Concentration
NRL, Washington, D.C.
DPM Sr90/10^6 Ft^3
NYOO
800
700
600
500
400
300
200
100
0
Apr May June July Aug Sept Oct Nov Dec Jan Feb Mar Apr May June July Aug Sept Oct Nov Dec Jan Feb Mar Apr May June July Aug Sept
1953
1954
1955

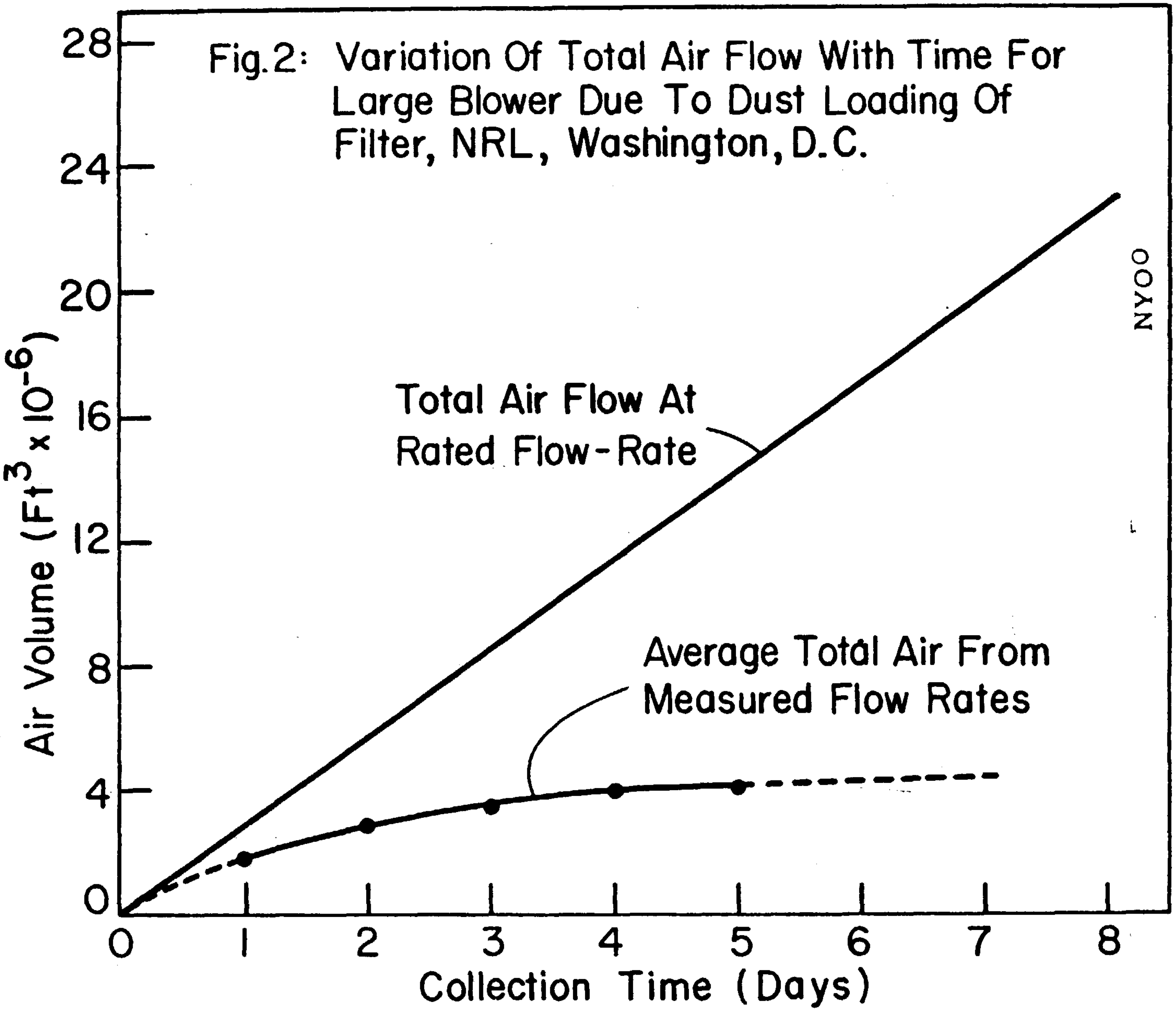

Fig. 2: Variation Of Total Air Flow With Time For Large Blower Due To Dust Loading Of Filter, NRL, Washington, D.C.

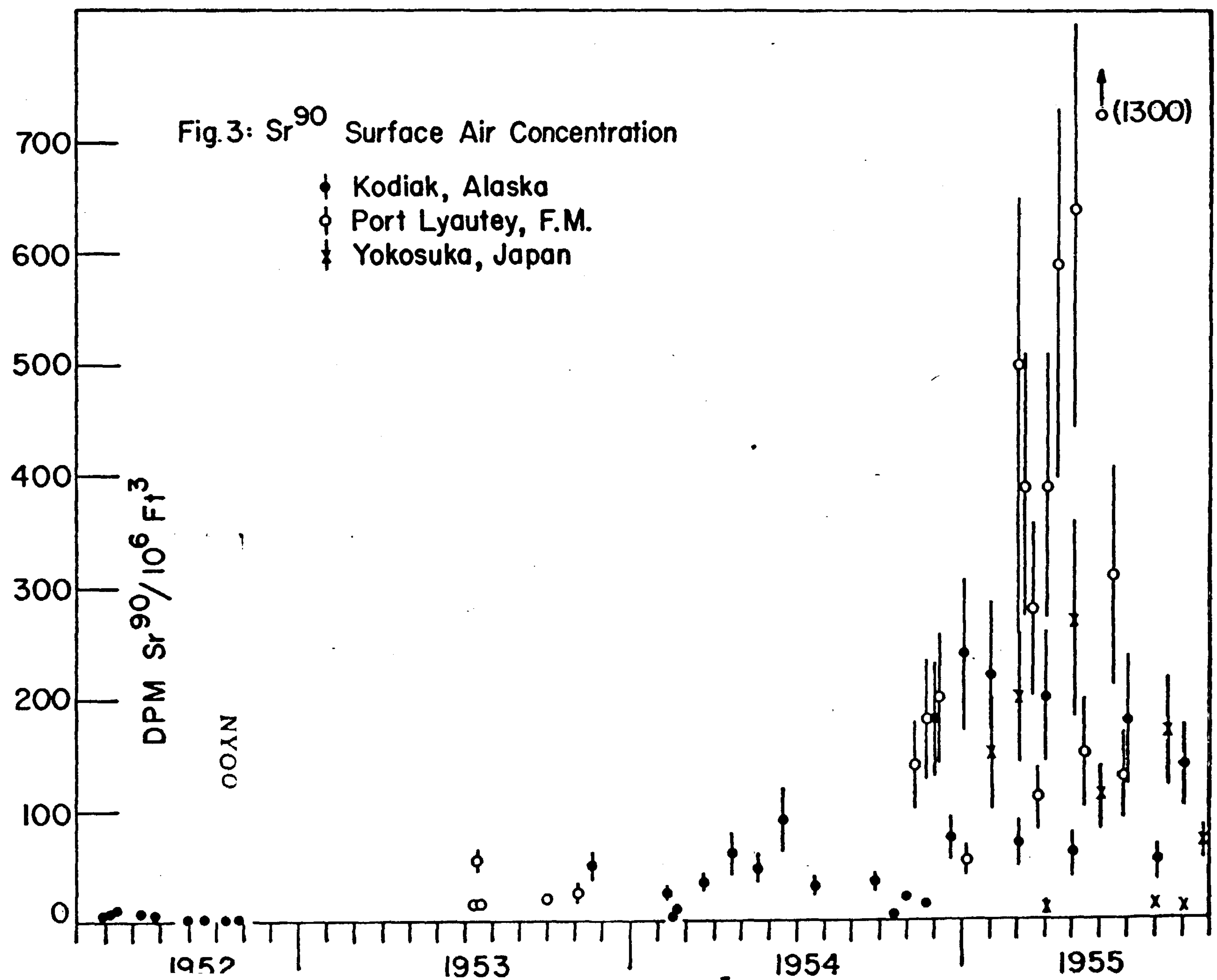

Fig. 3: Sr^{90} Surface Air Concentration

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The data for all four locations show generally the same concentration levels at any given time and all show a gradual and substantial increase during 1954. The concentrations observed at Kodiak, Alaska during and following the Spring 1952 tests are strikingly low by comparison with the 1954 and 1955 concentration data. The average Sr^{90} activity in 10^6 cubic feet of surface air appears to have increased from a pre-Ivy test level of about 4 dpm to a pre-Castle level of some 40 dpm and a post-Castle level of some 200 dpm.

Comparison of the Sr^{90} air concentration data with the daily total fission product beta activity data obtained by the NRL group indicates "apparent" ages for the mixed fission products of from one month to several years with wide variations during any given month. No conclusions with respect to the Sr^{90} production date may be drawn from such data for a number of reasons. The size distribution of the original bomb debris is dependent on the energy yield, orientation and environment of the weapon and for each case the mean size of particulates carrying Sr^{90} is expected to be smaller than that of mixed fission products. Furthermore, the particulates may be further fractionated by the action of rains, depending on the efficiency of scavenging by rains as a function of particle size. Another complication is that imposed by the size-collection efficiency of the device itself. Additional difficulties are imposed by the close spacing of tests during the last several years. Finally, there are large day to day variations in surface concentration of Sr^{90} and other fission products, apparently due to scavenging of surface air by vegetation and to the time interval between rains. NYOO

In spite of the many complicating factors indicated above which limit the meaningfulness of any individual measurement of Sr^{90} concentration and its relation to total fission product activity or to other individual fission product concentration, the general features of the Sr^{90} surface air concentration data shed considerable light on atmospheric circulation and storage of long lived fission products. The Sr^{90} air concentration history shows a marked general increase following the Ivy and Castle tests and thus appears to directly relate to the increased stratospheric storage following these tests. The general equivalence of the concentrations observed for the four stations, widely separated in geographical location, is strong indication that relatively old debris rather than fresh fission product activity is involved. Except for a few of the highest concentration values observed, the Sr^{90} data do not reflect any considerable contribution from individual small weapons tests for which tropospheric washout rates of several weeks or less have been estimated.

An air filter device, horizontally oriented near the ground surface in general will not collect large particles which fall directly or particles trapped in raindrops. Instead, it will collect a portion of those particles which mix downward between rains and persist in surface air plus some of the particles carried in the air downdraft associated with rains for which the scavenging efficiency of rains is low. Thus, the Sr^{90} surface air concentration data do not necessarily relate to the total deposition rate in any direct manner.

The Sr^{90} concentrations observed in surface air during the Fall 1954 and Spring 1955 are an order of magnitude lower than the limited U. S. and British measurements of upper troposphere concentration during the same period. The numbers are not necessarily inconsistent when consideration is given to dilution by cleaner surface air during downward mixing, to reduction resulting from scavenging by rains, and to removal from surface air by the filtration action of vegetaion foliage and the action of fog and dew. The mean troposphere

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concentration of Sr^{90} is undoubtedly a factor of 5 to 10 times higher than surface air values and thus corresponds to a total tropospheric air burden of one megaton of fission or so. These considerations provide additional basis for the argument that the Sr^{90} surface air concentration data relate to stratospheric debris since the total fission yield represented by this source will generally mask the Sr^{90} produced in tests of small atomic weapons. The low concentrations observed at Kodiak during June and July 1952 provide the most convincing argument that Nevada tests, and thus small weapons tests generally, contribute negligibly to the Sr^{90} concentration observed on surface air filters.

Thus, it appears that the measurement of Sr^{90} on surface air filters provides a direct measure of the stratospheric burden and that the apparent seasonal variation in the Sr^{90} surface air concentration may relate to seasonal variation in mixing through the tropopause and/or tropospheric washout rate.

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II. Sr^{90} in Chicago Rains

A. Summary of Chicago Rain Data, 1953 through 1955

Table 1 shows the estimated monthly and yearly totals of Sr^{90} deposited per square foot in the Chicago area, together with totals for rains actually measured.

The 1953 rain samples were roof run-off samples collected by the Chicago Tritium Research Group. For these, it is assumed that the result in disintegrations per minute was constant for each rain, and the Sr^{90} deposited per square foot was computed from the total precipitation in inches reported by the Weather Bureau for the University of Chicago station.

The 1954 samples were individual rains collected in a galvanized wash tub on the roof of the Jones Chemistry Laboratory building. For these, the total sample activity divided by the collection area was taken as the Sr^{90} deposited per square foot for individual rains.

For both 1953 and 1954 rains, the total monthly deposit was estimated by multiplying the deposit in disintegrations per minute per square foot per inch of rain for the rains measured by the total monthly precipitation in inches.

Table 2 shows the total monthly deposits for 1955 rains. At all three locations the 1955 collections were made in galvanized tubs, and the total monthly precipitation was taken. For these, the deposit per square foot was computed from total sample activity divided by collection area. The 1955 collections were made with the tubs exposed continuously and thus any dry material falling out between rains was included in the sample.

Table 1

Sr^{90} Deposited by 1953 and 1954 Chicago Rains

	1953 Chicago Rains		1954 Chicago Rains	
	Inches of Rain	DPM Sr^{90}/ft^2	Inches of Rain	DPM Sr^{90}/ft^2
January	1.20 (0)	- - -	1.01 (0)	- - -
February	1.45 (0.22)	0.99 (0.15)	2.17 (0)	- - -
March	3.59 (1.72)	7.15 (3.42)	4.44 (2.49)	64.0 (35.8)
April	2.83 (1.59)	47.8 (42.3)	4.53 (1.85)	15.7 (6.4)
May	2.04 (0.75)	6.0 (2.2)	2.25 (0.80)	21.3 (7.6)
June	4.49 (1.87)	37.1 (15.5)	2.73 (1.55)	27.0 (15.4)
July	3.95 (1.95)	22.4 (11.1)	6.37 (3.89)	18.7 (11.4)
August	1.32 (0.86)	2.16 (1.44)	6.12 (0.60)	45.3 (4.43)
September	2.17 (0.78)	39.0 (13.7)	0.98 (0)	- - -
October	1.58 (0.45)	45.2 (12.9)	11.69 (6.5)	21.2 (11.8)
November	1.53 (0.39)	2.0 (0.51)	1.37 (0.13)	7.4 (0.70)
December	2.44 (0)	- - -	2.05 (1.80)	27.0 (23.8)
Total		>210		>250

Notes: 1. Values in parentheses are totals for measured rains.

2. One April 1953 rain of 0.94 inches deposited 39.4 dpm Sr^{90}/ft^2. This rain was omitted in the estimation of the contribution of April rains which were not collected.

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3. The estimates for August and November 1954 are based on a very low fraction of the monthly precipitation with the result that the estimates are probably high for August and low for November. Such errors should approximately average out over the year.

Table 2

DPM Sr^{90}/Ft^2 Deposited by 1955 Rains and Snows

Month	Chicago	Pittsburgh	Washington, D.C.
January	6.6 (1.20")	- - -	- - -
February	~18.8*(1.61")	- - -	30.0 (1.74")
March	44.9 (2.17")	25.2 (3.40")	50.5 (3.49")
April	39.7 (2.42")	88.6 (4.84")	75.3 (2.33")
May	105.0 (2.66")	120.1 (1.82")	- - -
June	~67.8*(2.77")	80.3 (2.82")	- - -
July	31.6 (2.63")	78.6 (2.35")	- - -
August	13.0 (6.60")	133.0 (6.95")	- - -
September	10.8 (1.57")	8.3 (1.84")	- - -
October	27.5 (6.12")	31.7 (3.27")	- - -
November	18.2 (1.77")	15.6 (2.79")	- - -
December	5.5 (0.47")	7.9	- - -

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* Based on assay of two thirds of total monthly rainfall.

B. Test of Rain Collection Method

If the collection of precipitation is to be used as a method of following the deposition of fallout Sr^{90}, it would be highly desirable to increase the collection period to about one month. During a long period of collection, the collector would be alternately dry and wet. Under these circumstances, it may be considered that a significant amount of fallout would be blown out of the collector during dry periods between rains or accumulated in excess when the collector contained water.

As a test of these possibilities, a number of collections made at Chicago during March, April and May 1955 included, in addition to the standard open tub, a second tub covered with a plastic sheet with a small center hole and a third tub with the water level maintained at an inch or more by periodically adding water.

Results for the "covered" tub and "wet" tub collections have been reported in Chicago Bulletin No. 11 and in this report. In the case of the "wet" tub, the volume reported is that obtained from the collector area and depth of precipitation reported by the Weather Bureau for the University of Chicago station.

The total Sr^{90} activity collected by each of these methods can be directly compared since the collection areas are equal. The data are as follows:

1. Period 1000, March 16, 1955 to 0915, March 21, 1955

CL 459-P	Open tub	29.0 ± 2.0 dpm total
CL 460-P	Covered tub	31.8 ± 2.2 " "

2. Period 1530, March 21, 1955 to 1000, April 4, 1955

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CL 462 & 466	Open tub	45.1 ± 4.0 dpm total
CL 477	"Wet" tub	35.2 ± 2.2 " "

3. Period 0950, April 4, 1955 to 1400, April 14, 1955

CL 551-P	Open tub	29.0 ± 1.9 dpm total
CL 552-P	Covered tub	34.3 ± 2.4 " "

4. Period 2100, April 14, 1955 to 1630, April 20, 1955

CL 562-P	Open tub	53.5 ± 3.3 dpm total
CL 563-P	Covered tub	34.4 ± 1.8 " "

5. Period 1800, April 28, 1955 to 0930, May 13, 1955

CL 617-P	Open tub	67 ± 7 dpm total
CL 618-P	Covered tub	63 ± 9 " "
CL 619-P	"Wet" tub	72.8 ± 4.9 dpm total

6. Period 1100, May 13, 1955 to 1130, May 23, 1955

CL 627-P	Open tub	90 ± 5 dpm total
CL 628-P	Covered tub	70 ± 5 " "

7. Period 1700, May 23, 1955 to 1030, June 6, 1955

CL 648	Open tub	210 ± 8 dpm total
CL 645	Covered tub	239 ± 12 " "
CL 646	"Wet" tub	221 ± 8 " "

The agreement in total Sr^{90} activity collected by each of the several methods is gratifying. The only significant discrepancy is the low value for CL 563-P which might be explained by the occurrence of a very heavy rainfall with a possible resultant loss of sample due to splashing off the plastic cover. Another possibility is the occurrence of dry fallout which could have been blown off the plastic cover by surface winds. It appears that the Sr^{90} is water soluble at the time of collection and is not absorbed on the walls of the vessels. It is further indicated that once deposited in rains, the Sr^{90} fallout does not blow around significantly.

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These results testify to the adequacy of the water collection and chemical separation procedures used and indicate that an open tub provides for reliable collection of precipitation for extended periods of time. Since the Sr activity is apparently quite soluble, large volume collections can be safely aliquotted to reduce the sample shipment problem. Thus, the collection of precipitation appears to be a practicable method to augment, or even replace, the sticky paper collector as a general method of world wide monitoring.

C. Solubility of Sr^{90} Deposited in Rains

The above indirect evidence for the solubility of the Sr^{90} activity in fallout is confirmed by the analysis and measurement of the insoluble residues from Chicago rains. The insoluble residues from two active Chicago rains, CL 320 and CL 407 & 408, initially separated by filtration, were fused with Na_2CO_3 and dissolved in HCl. Following a fuming nitric acid separation of Sr, the samples were reserved for yttrium-90 growth and milked for the Y^{90} activity. The results are shown in Table 3 together with the Sr^{90} activity of the water soluble fraction.

Table 3

Solubility of Sr^{90} in Rains

	CL 320	CL 407-8
1. Total Sr^{90} Activity in Solution (DPM)	49.2 ± 0.5	29.9 ± 1.5
2. Total Sr^{90} Activity in Insoluble Residue (DPM)	≤ 0.6	0.7 ± 0.1
3. Percent of Total Activity in Insoluble Residue	$\leq 1.2\%$	$2.3 \pm 0.4\%$

D. Chicago Fallout History from Rain and Soil Data

The Sr^{90} data for Chicago rains and Chicago Milkshed soils are summarized in Figure 4 which gives the approximate total soil burden of Sr^{90} and its change with time over the three year period, January 1953 to December 1955. The curve is normalized to the average available Sr^{90} in six typical Chicago Milkshed soils collected on September 29 and 30, 1955. The total monthly fallout in Chicago rains are taken from Tables 1 and 2 above, and the method of measurement and data are discussed in the accompanying section. The Chicago Milkshed soil data are discussed below.

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The average available Sr^{90} observed for the same six soils samples in late September 1953 is also plotted. The agreement in this case may be partly

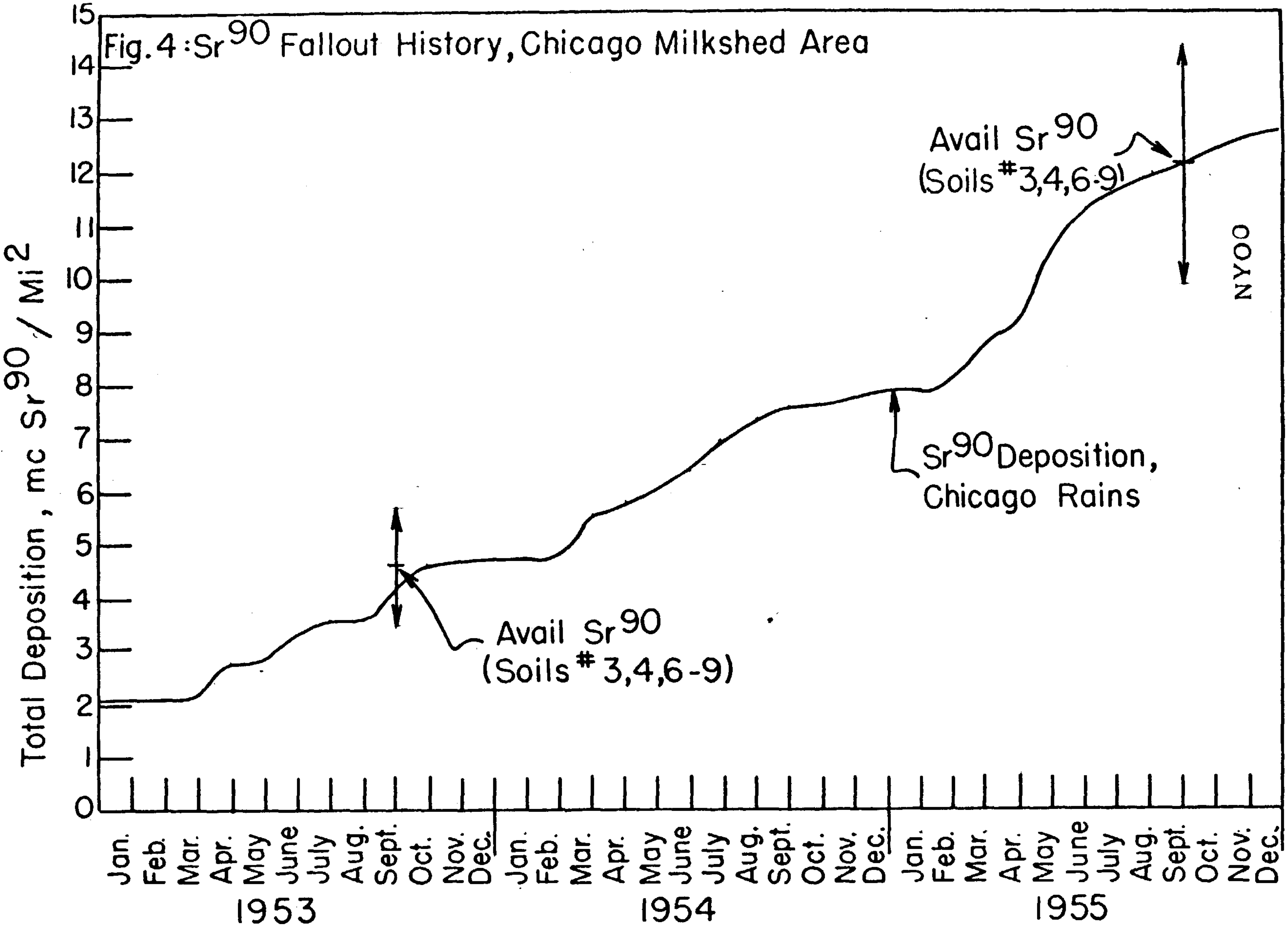
Fig. 4: Sr 90 Fallout History, Chicago Milkshed Area
Total Deposition, mc Sr 90 / Mi 2
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
Jan. Feb. Mar. Apr. May June July Aug. Sept. Oct. Nov. Dec.
1953
1954
1955
Avail Sr 90 (Soils # 3,4,6-9)
Sr 90 Deposition, Chicago Rains
Avail Sr 90 (Soils # 3,4,6-9)
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fortuitous since the available Sr^{90} in the soils, that fraction extractable into normal neutral ammonium acetate, is somewhat less than the total.

From Figure 3 it is clear that most of the fallout has been deposited since the beginning of 1953. The change in average annual slope indicates at least qualitatively the increasing annual contribution of stratospheric debris to total fallout. The general agreement between the change in soil level and cumulative fallout in rains during the intervening period is graphic indication that the scavenging of the atmosphere by rains is the primary mechanism of fallout. Sampling of rains with tubs continuously exposed will include collection of dry fallout of large particles which may be appreciable for considerable distances downwind of test areas during the first few days following an atomic test.

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III. Results for 1955 Chicago Milkshed Samples

A. 1955 Chicago Milkshed Soils

Table 4 summarizes the results obtained for the Chicago Milkshed soils collected September 29 and 30, 1955. The available calcium in grams per square foot was computed from Beltsville analyses of available calcium per unit weight of sample and total weight and area of sample collected. Strontium-90 analyses were made by the Chicago Sunshine Laboratory.

The samples were taken from the same fields of farms sampled in 1953 and again in 1954. Farms #3, #6 and #7 had been plowed recently. For each of these, 15 plugs, 3.5 inches in diameter, were taken to a depth slightly greater than apparent plow depth. On farm #7, two sets of samples were taken from alternately spaced holes to provide a check on the reliability of sampling recently plowed fields. The agreement in the results of the duplicate samples is very striking.

The results in dpm per square foot apply to the available strontium-90 (i.e., extractable in normal neutral ammonium acetate) and not necessarily the total strontium-90 deposited per square foot. Although the Chicago rain data indicate that the strontium-90 is deposited in soluble form, it is recalled that 1953 soil samples fused with Na_2CO_3 following successive NH_4AC and HCl extraction showed appreciable residual strontium-90.

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The average for the first six farms listed in Table 4 is 970 ± 180 dpm available strontium-90 per square foot, corresponding to about 12 millicuries per square mile for this area. The September 30, 1953 average for these same six soils was approximately 5 millicuries per square mile. The increase of 7 millicuries per square mile for the two year period is in surprisingly good agreement with the total deposition of strontium-90 in Chicago rains over the same time interval (see Figure 4).

Table 4

Available Sr^{90} in 1955 Chicago Milkshed Soils

Belts. #	CL #	Farm	Depth	S.U.	Avail. Ca g/ft²	Avail. Sr^{90} dpm/ft² (layer)	Avail. Sr^{90} dpm/ft² (total)
1503	1019	Swanson (#3)* Winnebago Co., Ill.	0-8"	6.83 ± 0.08	82.8	1240	1240
1500	956	Holcomb (#4) Rock Co., Wis.	0-2"	26.7 ± 1.0	15.0	881	1150
1501	957	Holcomb (#4) Rock Co., Wis.	2-6"	3.81 ± 0.14	31.8	267	
1502	1018	Premo (#6)* Columbia Co., Wis.	0-6"	15.0 ± 0.5	25.5	843	845
1496	886	Kurpeski (#7)* (Sample A) McHenry Co., Ill.	0-6.5"	11.9 ± 0.5	30.9	810	828
1497	887	Kurpeski (#7)* (Sample B) McHenry Co., Ill.	0-6.5"	12.6 ± 0.5	30.5	846	
1504	1020	Austin (#8) McHenry Co., Ill.	0-2"	49.9 ± 1.5	6.92	760	925
1505	1021	Austin (#8) McHenry Co., Ill.	2-6"	9.6 ± 0.4	7.8	165	
1498	888	McKee (#9) McHenry Co., Ill.	0-2"	9.8 ± 0.4	31.2	673	844
1499	955	McKee (#9) McHenry Co., Ill.	2-6"	0.99 ± 0.04	78.4	171	
1508	1022	Van Winkle (#11) Will Co., Ill.	0-2"	65.1 ± 2.6	4.4	630	742
1509	1023	Van Winkle (#11) Will Co., Ill.	2-6"	10.0 ± 0.4	5.1	112	
1510	1024	Carver (#12) Will Co., Ill.	0-2"	64.5 ± 1.3	3.7	525	698
1511	1025	Carver (#12) Will. Co., Ill.	2-6"	14.0 ± 0.7	5.6	173	

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* Field recently plowed

The soils for farms #11 and #12 are not typical for the Chicago Milkshed area but are coarse sandy soils included in the selection because of their very low calcium level. These two soils show the lowest 1955 level and the lowest two year increase in available strontium-90. While it is possible that they received less fallout, it is more likely that something in the chemistry of these two soils acts to reduce the fraction of "available" strontium-90. That these soils may be anomalous is further indicated by the unexpectedly low concentration of strontium-90 in the alfalfa grown on them (see Table 5 and discussion on page 22 below).

The strontium-90 measurements for the twelve Chicago Milkshed soils collected in late September 1953 have been summarized and discussed elsewhere.[3] The 1953 soils show an average of about 50 percent of the total available strontium-90 in the top one inch layer for unplowed soils. The 1955 soils show about 80 percent of the total available strontium-90 in the top two inches of unplowed soils. Since this observation applies equally well to the soils showing the lowest total available strontium-90 (farms #11 and #12), it appears that the leaching of strontium-90 to greater depths by natural processes is very slow.

B. 1955 Chicago Milkshed Alfalfas

Results for the alfalfa samples are presented in Table 5 together with the results for the soils from which they were collected. The soils are listed in order of decreasing concentration of available calcium in the 0-2" depth surface layer, as shown in column 2.

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The soil levels of available strontium-90 in "Sunshine Units" are listed in the third column together with the depth of the soil sample assayed. The results for soil samples of 0-2" depth increase fairly regularly with decreasing calcium concentration. For the three recently plowed soils, the "Sunshine Unit" values of 0-2" depth are undoubtedly some 2 to 3 times the values given.

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In controlled experiments, Menzel[4] has shown that the available strontium-90

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4. Menzel, R. G., Soil Science 77, 419 (1954).

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to available calcium ratio in plants is about half the corresponding soil ratio. Under uncontrolled field conditions, the relation of plant and soil level will be influenced by many complicating factors including possible leaf retention of strontium-90 fallout, variable root depth and soil moisture depth, the sharp gradient of strontium-90 concentration in the soil surface layer, and the application of fertilizers containing calcium. These factors undoubtedly account for considerable scatter in the results.

In the last column of Table 5, the strontium-90 to calcium level in alfalfas are arbitrarily compared to the same ratio in the 0-2" layer of the soils on which they were grown. The results appear quite reasonable with the exception of those for McKee, Van Winkle and Carver farms.

The high concentration for the McKee farm plant material may be explained by the fact that the sample taken was a mixture of bromegrass and ladino clover with shallower root depth than that of alfalfas and thus may relate to a higher soil level. Furthermore, the growth was short and sparse and was gleaned from several scattered patches apart from the point of soil sampling. Thus, differences in soil calcium or strontium-90 or a higher leaf retention effect may be involved. That this sample is not characteristic of the average McKee farm vegetation is indicated by the result of 0.51 $\pm$ 0.03 S.U. for the bone of a McKee farm steer killed in September 1955 (see CL 813-P and compare with CL 1011 and 1012). The three 1955 Chicago Milkshed animal bone samples show the lowest strontium-90 level for the farm with the highest soil calcium level and the highest bone level for that of the lowest calcium, as would normally be expected.

Dr. L. T. Alexander, Chief of the Department of Agriculture Soil Survey Laboratory, Beltsville, Maryland, has suggested that the low results for alfalfas grown on the two Plainfield sand soils (farms #11 and #12) may be due to greater root depth which would result in their getting most of their calcium well below the surface and hence out of reach of the majority of the strontium-X activity.

Table 5

Comparison of Sr^{90} Level in Related Alfalfa and Soil Samples

Farm	Avail. Ca 0-2" depth (g/ft^2)	Sr^{90} Soil Level, in S.U.	Sr^{90} Plant Level, in S.U.	Ratio**
McKee (#9) McHenry Co., Ill.	31.2	(0-2"), 9.8 ± 0.4	30.5 ± 1.7	3.1
Swanson (#3)* Winnebago Co., Ill.	~20.7	(0-8"), 6.83 ± 0.08	13.6 ± 0.8	(~0.8)
Holcomb (#4) Rock Co., Wis.	15.0	(0-2"), 26.7 ± 1.0	19.2 ± 1.0	0.72
Kurpeski (#7)* McHenry Co., Ill.	~9.4	(0-6.5"), 12.3 ± 0.4	7.05 ± 0.33	(~0.2)
Premo (#6)* Columbia Co., Wis.	~8.2	(0-6"), 15.0 ± 0.5	25.5 ± 1.3	(~0.7)
Austin (#8) McHenry Co., Ill.	6.92	(0-2"), 49.9 ± 1.5	38.0 ± 2.0	0.76
Van Winkle (#11) Will Co., Ill.	4.4	(0-2"), 65.1 ± 2.6	4.74 ± 0.21	0.073
Carver (#12) Will Co., Ill.	3.7	(0-2"), 64.5 ± 1.3	2.73 ± 0.18	0.042

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* Field recently plowed.

** Ratio = S.U. Plant/S.U. Soil over 0-2" depth. (For the three unplowed soils, the 0-2" depth concentration of Sr^{90} is arbitrarily taken as 2.5 times that determined for the greater depth.

IV. Fresh Milk from Chicago Dairies

Samples of 2 to 3 gallons of fresh milk were obtained monthly from several of the larger Chicago dairies for one year beginning in March 1955. The results in Sunshine Units are presented in Figure 5 which shows the very interesting seasonal variation in the Sr^{90} level of forage and dairy products.

The January-February 1956 Sr^{90} level appears to be a good average of the levels observed over the 1955 growing season. That is to be expected, since over the winter months the cows feed on hay gathered at various times during the previous growing season. Similarly, the March-April 1955 level must represent the average for 1954.

The sharp rise in the Spring of 1955 may be due in part to leaf retention of fallout from the concurrent Nevada tests. However, the rise may be explainable in terms of other factors. When first pastured in the Spring, the cows change from feed grown an average of eight months earlier to new growth, representing an increase in Sr^{90} level due to the total additional Sr^{90} fallout during the eight months period. Furthermore, the spring pasturage for the most part may be unplowed fields.

The fall-off during the summer may be due to several factors: a larger proportion of feed from recently plowed fields, greater root depth and thus lower Sr^{90} level for more mature plants, and lower Sr^{90} retention in milk as a result of richer calcium diet. To the extent that leaf retention is involved, it should have lower effect in summer consistent with the lower observed fallout during the summer months (see 1955 Chicago Rain Data, Table 2 above).

NYOO

The increase from the March 1955 level to the February 1956 level is somewhat greater than the corresponding increase in the total Sr^{90} soil level from July 1954 to July 1955 (see Figure 4). The greater increase in milk level may be the consequence of higher fallout, and thus higher leaf retention, in 1955

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A1091-2

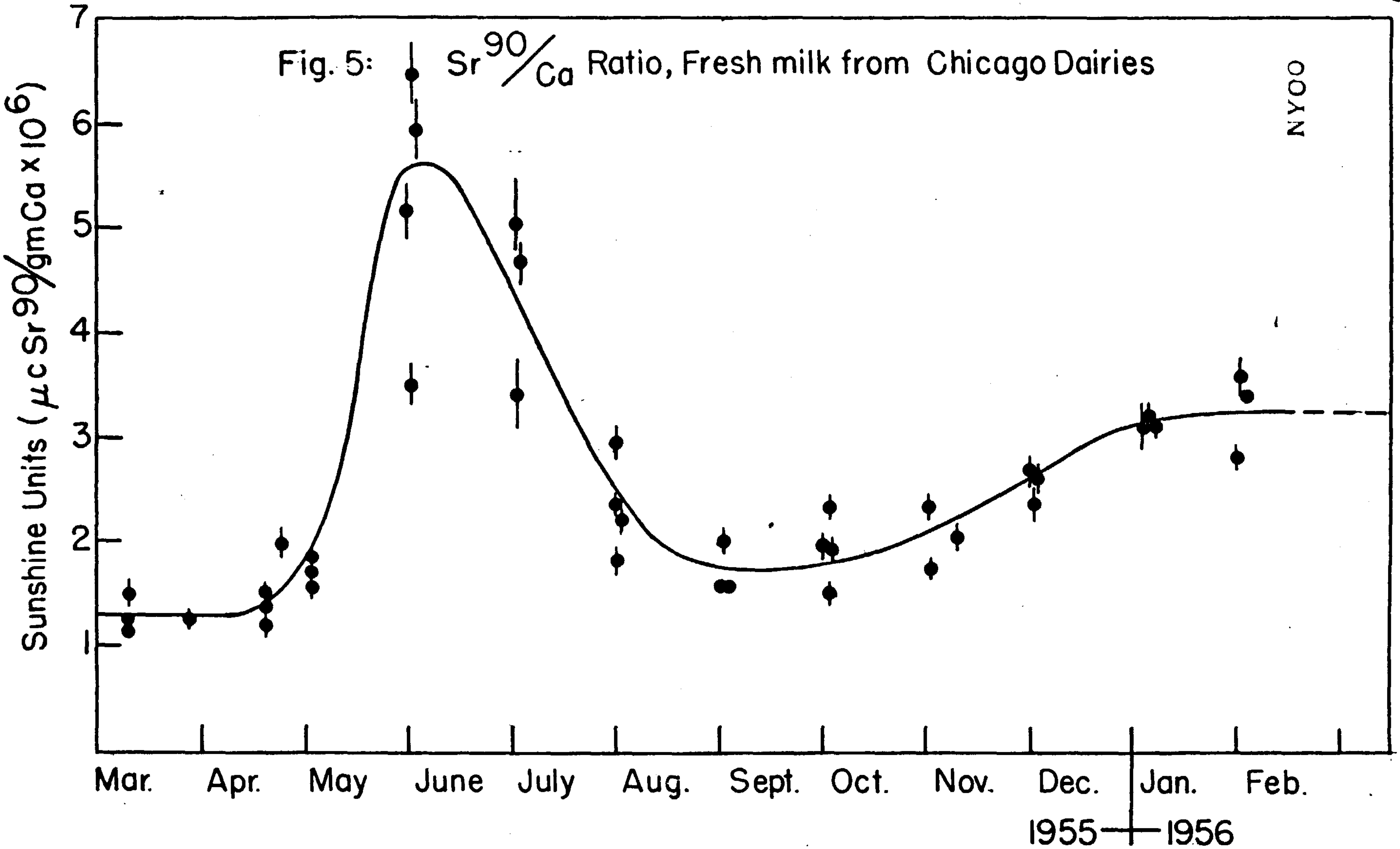

Fig. 5: Sr^{90}/Ca Ratio, Fresh milk from Chicago Dairies

than in 1954. Another possible explanation would be the reduced effect of plowing on lowering the average Sr^{90} level at root depth in successive years.

The data in Figure 5 indicate that the sampling was surprisingly good, since the only considerable scatter occurs during the sharp spring rise. The monitoring of milk from large dairies appears to provide a good record of plant and dairy product activity levels over the growing season for a given area and also provides a basis for comparison of the activity of plants and dairy products from widely scattered areas.

NYOO

V. Sr^{90} Content of Foreign Soils

The results of Sr^{90} analyses for all foreign soil samples assayed since the publication of Chicago Sunshine Bulletin No. 11, December 1, 1955, are summarized in Table 6. Results for earlier foreign soil measurements, which include most of the data for soils collected during and prior to the Spring of 1954, have been reported by W. F. Libby.[3]

The results reflect the substantial increase in the world-wide distribution of Sr^{90} fallout following the CASTLE tests. The increase is particularly striking for the southern hemisphere samples which show about an order of magnitude increase in the Sr^{90} soil content for the period from Spring 1954 to January 1956.

Two of the South American samples (Beltsville #56456 from Lima, Peru and #56447 from Antofagasta, Chile) are representative of areas of very low rainfall. Comparing their results with those for the São Paulo, Brazil and Antofagasta, Chile soils indicates a striking dependence of the fallout on rainfall. The result for the Brawley, California soil (CL 1127, reported on page 44, this report), which shows ≤0.8 Sunshine Units, corresponding to ≤1.2 millicuries of Sr^{90} per square mile, is equally convincing in this respect. It would appear that, except within several thousand miles downwind of test areas where large particles of dry debris may fall out directly for a short period following a test shot, precipitation must be the only important mechanism of fallout. This dependence can be further tested by relating the Sr^{90} soil level to rainfall information for areas remote from test sites. The latitude dependence of fallout, pointed out by W. F. Libby,[3] should be taken into account when such a correlation is attempted.

Table 6

Sr^{90} Content of Foreign Soils

Belts. No.	Location	Collection Date	Depth	Sr^{90} (S.U.)	g Ca/ft^2	Mc/mi^2
551284	Turkey #1	Feb. 1954	0-2"	2.44 ± 0.13	33.2	2.3
551285	Turkey #2	Feb. 1954	0-2"	1.52 ± 0.05	29.5	1.3
551286	Turkey #3	Feb. 1954	0-2"	1.29 ± 0.06	30.4	1.1
55772	Italy	Feb. 1955	0-4"	1.64 ± 0.05	88.2	4.0
55877	Turkey	Feb. 1955	0-4"	1.28 ± 0.07	106.4	3.8
55878A	Ankara, Turkey	Feb. 1955	0-4"	2.4 ± 0.2	31.8	2.7
55878B	Ankara, Turkey	Feb. 1955	0-4"	1.01 ± 0.12	19.8	
55591A	Beirut, Lebanon	Feb. 1955	0-4"	4.4 ± 0.2	32.1	4.6
55591B	Beirut, Lebanon	Feb. 1955	0-4"	1.22 ± 0.13	20.5	
55592A	Terbol, Lebanon	Feb. 1955	0-4"	2.04 ± 0.13	29.0	2.4
55592B	Terbol, Lebanon	Feb. 1955	0-4"	1.56 ± 0.12	17.7	
55590	Damascus, Syria	Feb. 1955	0-4"	1.40 ± 0.10	62.8	2.5
55614	Paris, France	Feb. 1955	0-4"	0.69 ± 0.05	66.2	1.3
55643	Tokyo, Japan	Feb. 1955	0-4"	3.74 ± 0.34	20.3	2.1
55644	Tokyo, Japan	Feb. 1955	0-4"	5.86 ± 0.29	18.9	3.1
55645	Dakar, F.W. Africa	Feb. 1955	0-4"	3.71 ± 0.14	4.4	0.45
55647	Algiers, Algeria	Feb. 1955	0-4"	1.20 ± 0.08	60.0	2.0
55648	Algiers, Algeria	Feb. 1955	0-4"	2.9 ± 0.2	53.8	4.4
55646	Dakar, F.W. Africa	Feb. 1955	0-4"	9.31 ± 0.74	1.3	0.31
55672	New Delhi, India	Feb. 1955	0-4"	0.40 ± 0.02	204.8	3.0
55673	New Delhi, India	Feb. 1955	0-4"	0.64 ± 0.05	300.8	5.5
55777	Durban, S. Africa	Feb. 1955	0-4"	4.43 ± 0.19	12.6	1.6
55786	Aden, Saudi Arabia	Feb. 1955	0-4"	1.02 ± 0.06	150.9	4.3
54288	Belo Horizonte, Brazil	Mar. 1954	0-4"	5.3 ± 2.1	0.77	0.11

Table 6 (Cont'd)

Belts. No.	Location	Collection Date	Depth	Sr^{90} (S.U.)	g Ca/ft^2	Mc/mi^2
54289	Belo Horizonte, Brazil	Mar. 1954	0-4"	7.1 ± 0.7	0.84	0.17
56448	São Paulo, Brazil	Jan. 1956	0-6"	3.04 ± 0.27	21.0	1.8
56450	Asuncion, Paraguay	Jan. 1956	0-6"	11.3 ± 0.8	6.1	1.9
56456	Lima, Peru	Jan. 1956	0-6"	0.60 ± 0.04	42.7	0.69
56447	Antofagasta, Chile	Jan. 1956	0-½"	0.44 ± 0.04	1.7	0.02

CHICAGO SUNSHINE RESULTS FOR PERIOD DECEMBER 1, 1955 TO AUGUST 1, 1956

Sample	Sunshine Units
I. Human Bone In all cases, the date of sample corresponds to the date of death or post-mortem.	
A. **Newborn** (under 30 days)	
1. United States	
a. Furnished by Dr. Shields Warren, Cancer Research Institute, New England Deaconess Hospital, Boston, Massachusetts.	
(1) CL 993: Age 10 days, A55-317, December 22, 1955, vertebrae, 5.14 g ash, 1.96 g Ca.	0.70 ± 0.04
(2) CL 999-P: Age 9 days, A55-326, December 30, 1955, vertebrae and ribs, 4.55 g ash, 1.62 g Ca.	0.45 ± 0.10
2. Foreign, Southern Hemisphere	
a. Santiago, Chile: Furnished by Dr. Juan Vial, Catholic University School of Medicine, Santiago, Chile. Collection arrangements made by Dr. R. B. Watson, Rockefeller Foundation, Rio de Janeiro, Brazil.	
(1) CL 717-P: Age 4 days, August 2, 1955, femur, ribs and sternum, 0.91 g ash, 0.37 g Ca.	1.2 ± 0.3
(2) CL 718-P: Age 2 days, August 10, 1955, femur, ribs, sternum, vertebral column and parietal, 7.1 g ash, 2.7 g Ca.	0.17 ± 0.03
(3) CL 720-P: Age 2 days, August 11, 1955, ribs, sternum, vertebral column and parietal, 6.7 g ash, 2.65 g Ca.	0.15 ± 0.05
(4) CL 722-P: Age 5 days, August 12, 1955, ribs, sternum, vertebral column and parietal, 6.1 g ash, 2.39 g Ca.	0.31 ± 0.04
(5) CL 723-P: Age 3 days, August 13, 1955, ribs, sternum, vertebral column and parietal, 6.3 g ash, 2.33 g Ca.	0.14 ± 0.04
(6) CL 726-P: Age 9 days, August 18, 1955, ribs, sternum, vertebral column and parietal, 4.5 g ash, 1.67 g Ca.	0.33 ± 0.06

Sample	Sunshine Units
b. Lima, Peru: Furnished by Dr. Alberto Hurtado, Maternity Hospital of Lima. Collection arrangements made by Dr. R. B. Watson, Rockefeller Foundation, Rio de Janeiro, Brazil.	
(1) CL 812-P: Age few hours, July 4, 1955, ribs and femur, 0.903 g ash, 0.334 g Ca.	<0.45
(2) CL 809-P: Age few hours, July 6, 1955, ribs and femur, 1.26 g ash, 0.46 g Ca.	0.44 ± 0.16
(3) CL 804: Age few hours, August 3, 1955, ribs and femur, 5.1 g ash, 1.96 g Ca.	≤ 0.2
(4) CL 807: Age 6 days, A #55-247, August 4, 1955, ribs and femur, 2.4 g ash, 1.11 g Ca.	≤ 0.6
(5) CL 806: Age few hours, A #55-251, August 8, 1955, ribs and femur, 1.26 g ash, 0.49 g Ca.	≤ 0.7
(6) CL 810-P: Age 8 days, A #55-246, August 5, 1955, 1.83 g ash, 0.68 g Ca.	0.36 ± 0.12
(7) CL 811: Age few hours, A #55-245, August 5, 1955, ribs and femur, 2.4 g ash, 0.99 g Ca.	0.7 ± 0.1
(8) CL 808-P: Age 10 days, A #55-365, September 9, 1955, ribs and femur, 1.08 g ash, 0.4 g Ca.	0.64 ± 0.28
(9) CL 805-P: Age 14 days, A #55-367, September 10, 1955, ribs and femur, 1.2 g ash, 0.52 g Ca.	2.16 ± 0.40
B. Children (30 days to 15 years)	
1. United States	
a. Furnished by Dr. Shields Warren, Cancer Research Institute, New England Deaconess Hospital, Boston, Massachusetts.	
(1) CL 850-P: Age $8\frac{1}{2}$ years, Massachusetts, A35102, April 15, 1955, vertebrae, 5.47 g ash, 2.26 g Ca.	0.13 ± 0.04
(2) CL 851: Age 2 10/12 years, Massachusetts, A55-103, April 16, 1955, vertebrae, 5.1 g ash, 1.84 g Ca.	≤ 0.21

NYOO

Sample	Sunshine Units
(3) CL 852-P: Age 7 months, Rhode Island, A55-104, April 18, 1955, vertebrae, 5.18 g ash, 1.82 g Ca.	0.82 ± 0.08
(4) CL 855-P: Age 14 months, Massachusetts, A55-108, April 21, 1955, vertebrae, 4.42 g ash, 1.23 g Ca.	0.65 ± 0.12
(5) CL 856-P: Age 7 years, Massachusetts, A55-109, April 21, 1955, vertebrae, 6.41 g ash, 2.37 g Ca.	0.22 ± 0.04
(6) CL 854-P: Age 2 3/4 years, Massachusetts, A55-110, April 24, 1955, vertebrae, 3.69 g ash, 1.38 g Ca.	0.29 ± 0.08
(7) CL 862-P: Age 6 years, New York, A160953, April 29, 1955, ribs, 6.97 g ash, 2.64 g Ca.	0.28 ± 0.03
(8) CL 853-P: Age 4 years, Massachusetts, A55-116, April 30, 1955, vertebrae, 2.55 g ash, 0.97 g Ca.	0.63 ± 0.19
(9) CL 860-P: Age $1\frac{1}{2}$ years, Massachusetts, A55-117, May 7, 1955, vertebrae, 6.56 g ash, 2.40 g Ca.	0.23 ± 0.04
(10) CL 859-P: Age 3 1/12 years, California, A55-122, May 8, 1955, vertebrae, 4.31 g ash, 1.57 g Ca.	$<$ 0.10
(11) CL 858-P: Age 6 weeks, Massachusetts, A128, May 10, 1955, vertebrae, 2.30 g ash, 0.85 g Ca.	0.71 ± 0.20
(12) CL 857-P: Age 5 2/12 years, New Hampshire, A417286, May 18, 1955, vertebrae, 3.88 g ash, 1.29 g Ca.	0.40 ± 0.12
(13) CL 992-P: Age $11\frac{1}{2}$ months, Massachusetts, A55-304, December 14, 1955, vertebrae, 3.71 g ash, 1.21 g Ca.	0.69 ± 0.12
(14) CL 995: Age 10 years, Massachusetts, A55-319, December 22, 1955, vertebrae, 4.21 g ash, 1.52 g Ca.	1.4 ± 0.2
	NYOO
(15) CL 994-P: Age 13 years, North Carolina, A55-318, December 23, 1955, vertebrae, 31.45 g ash, 11.5 g Ca.	0.26 ± 0.07

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	Sample	Sunsh
(16)	CL 996: Age 3 years, Massachusetts, A55-320, December 23, 1955, ribs and vertebrae, 5.33 g ash, 2.04 g Ca.	0.60 ±
(17)	CL 998-P: Age $2\frac{1}{2}$ years, Massachusetts, A55-325, December 28, 1955, vertebrae and ribs, 9.90 g ash, 3.02 g Ca.	0.47 ±
(18)	CL 1000-P: Age 11 years, Massachusetts, A55-327, December 30, 1955, vertebrae and ribs, 33.48 g ash, 10.3 g Ca.	0.21 ±
(19)	CL 1001: Age 6 years, New York, A56-1, January 1, 1956, vertebrae, 4.95 g ash, 1.85 g Ca.	0.6 ±
(20)	CL 1002: Age 1 1/3 years, Massachusetts, A56-2, January 1, 1956, vertebrae, 2.25 g ash, 0.82 g Ca.	1.7 ±
(21)	CL 1003: Age 7 weeks, Massachusetts, A56-3, January 2, 1956, vertebrae, 2.97 g ash, 1.04 g Ca.	0.80
(22)	CL 1004-P: Age 2 3/4 years, Rhode Island, A56-5, January 4, 1956, vertebrae, 6.8 g ash, 1.91 g Ca.	0.26
(23)	CL 1006-P: Age 5 months, New Hampshire, A56-6, January 6, 1956, vertebrae and ribs, 6.96 g ash, 2.16 g Ca.	0.97
(24)	CL 1007-P: Age $2\frac{1}{2}$ years, Massachusetts, A56-10, January 10, 1956, vertebrae, 5.98 g ash, 1.73 g Ca.	0.42

C. Adults (over 15 years)

1. United States

a. Furnished by Dr. Shields Warren, Cancer Research Institute, New England Deaconess Hospital, Boston, Massachusetts.

	Sample	Sunsh
(1)	CL 863-P: Three samples combined, age range 40-44 years, Massachusetts, ribs, sterna and vertebrae, 51.2 g ash, 17.7 g Ca.	0.046
(a)	#161066, age 44 years, May 5, 1955.	N
(b)	#55A56, age 40 years, May 26, 1955.	
(c)	#161952, age 40 years, June 8, 1955.	

Sample	Sunshine Units
(2) CL 663-P: Four samples combined, age range 49-57 years, 88.47 g ash, 33.2 g Ca.,	0.036 ± 0.009
(a) #159893, age 57 years, Rhode Island, March 12, 1955.	
(b) #159920, age 54 years, Massachusetts, March 15, 1955.	
(c) #160704, age 49 years, Massachusetts, April 19, 1955.	
(d) #55A40, age 57 years, Massachusetts, April 22, 1955.	
(3) CL 864-P: Six samples combined, age range 51-57 years, Massachusetts, vertebrae, 75.38 g ash, 25.6 g Ca.	0.076 ± 0.007
(a) #160934, age 53 years, April 29, 1955.	
(b) #161007, age 52 years, May 3, 1955.	
(c) #55A49, age 57 years, May 9, 1955.	
(d) #55A50, age 51 years, May 13, 1955.	
(e) #161984, age 55 years, June 10, 1955.	
(f) #163751, age 51 years, September 7, 1955.	
(4) CL 866-P: Three samples combined, age range 61-69 years, Massachusetts, femurs, 131.1 g ash, 49.9 g Ca.	0.029 ± 0.005
(a) #161533, age 69 years, May 21, 1955.	
(b) #161659, age 61 years, May 26, 1955.	
(c) #161820, age 67 years, June 3, 1955.	NYOO
(5) CL 865-P: Six samples combined, age range 63-69 years, Massachusetts, vertebrae and clavicle, 75.0 g ash, 26.8 g Ca.	0.11 ± 0.03
(a) #161093, age 67 years, May 6, 1955.	
(b) #161134, age 67 years, May 7, 1955.	
(c) #55A51, age 69 years, May 14, 1955.	
(d) #55A55, age 69 years, May 23, 1955.	

Sample	Sunshine Units
(e) #161675, age 67 years, May 27, 1955.	
(f) #161787, age 63 years, June 2, 1955.	
(6) CL 867-P: Five samples combined, age range 71-77 years, Massachusetts, femurs, 228.2 g ash, 91.1 g Ca.	0.025 ± 0.003
(a) #161028, age 76 years, May 6, 1955.	
(b) #161564, age 77 years, May 23, 1955.	
(c) #161660, age 72 years, May 26, 1955.	
(d) #161789, age 71 years, June 2, 1955.	
(e) #162106, age 71 years, June 15, 1955.	
(7) CL 868-P: Seven samples combined, age range 70-81 years, vertebrae, sternum and ribs, 148.3 g ash, 55.4 g Ca.	0.031 ± 0.007
(a) #161001, age 70 years, Connecticut, May 2, 1955.	
(b) #161294, age 73 years, Rhode Island, May 13, 1955.	
(c) #161539, age 74 years, Massachusetts, May 23, 1955.	
(d) #161605, age 80 years, Massachusetts, May 24, 1955.	
(e) #161887, age 81 years, Massachusetts, June 7, 1955.	
(f) #161920, age 70 years, New England, June 8, 1955.	
(g) #161985, age 75 years, Massachusetts, June 9, 1955.	
b. Furnished by Dr. R. Hasterlik, Argonne Cancer Research Hospital, University of Chicago, Chicago, Illinois.	
(1) CL 638: Four samples combined, age range 40-47 years, Chicago, 52.3 g ash, 19.79 g Ca.	≤0.02
(a) #9386, age 46 years, April 7, 1955.	

NYOO

Sample	Sunshine Units
(b) #9390, age 47 years, April 12, 1955.	
(c) #9414, age 40 years, May 6, 1955.	
(d) #9426, age 41 years, May 20, 1955.	

2. Foreign, Southern Hemisphere

a. Brazil: Furnished by Dr. Paolo Conto, Faculdade de Medicina, Universidade de Recife, Pernambuco, Brazil. Collection arrangements made by Dr. R. B. Watson, Rockefeller Foundation, Rio de Janeiro, Brazil.

Sample	Sunshine Units
(1) CL 770-P: Age 18 years, Recife, January 1, 1955, clavicle, 5.89 g ash, 2.25 g Ca.	0.14 ± 0.05
(2) CL 767: Age 24 years, Recife, January 20, 1955, humerus, 8.32 g ash, 3.32 g Ca.	≤ 0.09
(3) CL 768: Age 24 years, Recife, March 13, 1955, metacarpals and phalanges, 4.71 g ash, 1.88 g Ca.	≤ 0.16
(4) CL 766: Age 26 years, Recife, August 31, 1955, femur, 12.24 g ash, 4.75 g Ca.	≤ 0.07

b. Brazil: Furnished by Dr. Jairo Câmara, Faculdade de Medicina, Universidade de Minas Gerais, Belo Horizonte, Brazil. Collection arrangements made by Dr. R. B. Watson, Rockefeller Foundation, Rio de Janeiro, Brazil.

Sample	Sunshine Units
(1) CL 739, Age 34 years, Marque, July 20, 1955, sternum and cartilage, rib fragments, 9.7 g ash, 3.14 g Ca.	≤ 0.02
(2) CL 764-P: Age 30 years, Belo Horizonte, September 9, 1955, 14.27 g ash, 5.06 g Ca.	0.12 ± 0.02

D. Dentine

NYOO

Sample	Sunshine Units
1. CL 665-P: Permanent teeth from persons over 15 years of age, Bristol, England, furnished by Dr. Shields Warren, Cancer Research Institute, New England Deaconess Hospital, Boston, Massachusetts, #L3, collected January to April 1955, 32.32 g ash, 12.5 g Ca.	0.026 ± 0.011

Sample	Sunshine Units
II. Animal Bone	
A. United States	
1. Chicago Milkshed Farms: Collected by Dr. E. A. Martell.	
a. CL 813-P: Leg bone of Holstein-Angus, age 1½ years, McKee Farm (#9), McHenry County, Illinois, killed September 22, 1955, 1374 g ash, 35.3 g Ca.	0.51 ± 0.03
b. CL 1012-P: Steer leg bones, age 19 months, Swanson Farm (#3), Winnebago County, Illinois, killed middle of November 1955, 279.8 g ash, 19.5 g Ca.	2.09 ±0.11
c. CL 1011-P: Steer leg bone, age 15 months, Grabow Farm (#1), Rock County, Wisconsin, killed January 15, 1956, 440.2 g ash, 122.6 g Ca.	5.50 ± 0.27
2. Interlaboratory check sample, Cornell lamb bone, New York, age 6 months, furnished by Dr. Lyle T. Alexander, Beltsville #551512, killed September 15, 1955. Four replicates assayed as individual samples.	
a. CL 841: Cornell lamb bone #31, 24.86 g ash, 8.96 g Ca.	4.45 ± 0.34
b. CL 842: Cornell lamb bone #32, 25.07 g ash, 9.26 g Ca.	5.14 ± 0.23
c. CL 843-P: Cornell lamb bone #33, 24.86 g ash, 8.26 g Ca.	6.98 ± 0.34
d. CL 844-P: Cornell lamb bone #34, 24.95 g ash, 11.1 g Ca.	4.45 ± 0.24
3. Interlaboratory check sample, calf bone, age 9 months, Tifton, Georgia, Beltsville #551168, killed last week in October 1955.	NYOO
a. CL 972: 31.8 g ash, 12.05 g Ca.	12.9 ± 0.6
b. CL 973: 30.87 g ash, 11.42 g Ca.	10.3 ± 0.3
c. CL 974-P: 32.93 g ash, 12.2 g Ca.	12.7 ± 0.7
d. CL 975-P: 31.45 g ash, 11.9 g Ca.	11.4 ± 0.6

Sample	Sunshine Units
B. Foreign, Southern Hemisphere	
1. CL 1130-P: Lamb bones, Montaro Valley, Huan Cayo, Peru, collected by Dr. M. Drosdoff, ICA, USOM to Peru, Beltsville #56475, received May 23, 1956, 144.2 g ash, 18.43 g Ca.	7.48 ± 0.44
III. Animal Products	
A. Cheese	
1. United States	
a. CL 707-P: Domestic Swiss, Wisconsin, 15 lbs. purchased from V. Berg, Chicago, August 25, 1955, manufactured April 19, 1955, 281.2 g ash, 51.0 g Ca.	10.4 ± 0.4
b. CL 836: Domestic Münster, Dodge County, Wisconsin, 19.5 lbs. purchased from V. Berg, Chicago, November 30, 1955, manufactured October 11, 1955, 271.5 g ash, 20.0 g Ca.	6.7 ± 0.3
c. CL 838: Domestic Swiss, Green County, Wisconsin, 13.75 lbs. purchased from V. Berg, Chicago, November 30, 1955, manufactured September 2, 1955, 212.5 g ash, 56.4 g Ca.	6.8 ± 0.2
d. CL 1036-P: Domestic Münster, Wisconsin, 17 3/4 lbs. purchased from V. Berg, Chicago, March 16, 1956, manufactured January 1956, 122.2 g ash, 6.53 g Ca.	3.37 ± 0.21
e. CL 1038-P: Domestic Swiss, Wisconsin, 18½ lbs. purchased from V. Berg, Chicago, March 16, 1956, manufactured December 1955, 160.2 g ash, 12.8 g Ca.	4.70 ± 0.28
2. Foreign, Northern Hemisphere	
a. CL 294-P: Imported Danish Blue, Denmark, 19¼ lbs. purchased from V. Berg, Chicago, October 21, 1954, manufactured in April 1954, 174.86 g ash, 16.6 g Ca.	0.65 ± 0.05
b. CL 708-P: Imported Swiss, Switzerland, 12 lbs. purchased from V. Berg, Chicago, August 25, 1955, manufactured in February 1955, 217.5 g ash, 40.0 g Ca.	2.27 ± 0.13
c. CL 839: Imported Swiss, Switzerland, 12.5 lbs. purchased from V. Berg, Chicago, November 30, 1955, manufactured May 1955, 157.3 g ash, 42.53 g Ca.	9.33 ± 0.24

Sample	Sunshine Units
d. CL 1037-P: Imported Swiss, Switzerland, 15 lbs. purchased from V. Berg, Chicago, March 16, 1956, manufactured in June 1955, 79.9 g ash, 13.7 g Ca.	1.06 ± 0.05
e. CL 849: Imported Danish Blue, Denmark, 18.25 lbs. purchased from V. Berg, Chicago, November 30, 1955, manufactured in July 1955, 138.8 g ash, 13.5 g Ca.	2.6 ± 0.2
f. CL 1035-P: Imported Danish Blue, Denmark, 18½ lbs. purchased from V. Berg, Chicago, March 16, 1956, manufactured Fall-Winter, 1955, 159.1 g ash, 5.44 g Ca.	11.0 ± 0.7
3. Foreign, Southern Hemisphere	
a. CL 669-P: Cheddar, Perth, Australia, 2 lbs., Beltsville #55841, received June 20, 1955, 34.7 g ash, 7.59 g Ca.	1.26 ± 0.13
B. Milk	
1. Fresh Milk from Chicago Dairies	
a. CL 673-P: Bowman Dairy, purchased June 1, 1955, 43.5 g ash, 8.08 g Ca.	3.5 ± 0.2
b. CL 701-P: Borden Dairy, purchased August 1, 1955, 64.8 g ash, 12.0 g Ca.	1.82 ± 0.08
c. CL 702-P: Wanzer Dairy, purchased August 1, 1955, 56.3 g ash, 11.5 g Ca.	2.94 ± 0.17
d. CL 703-P: Bowman Dairy, purchased August 1, 1955, 77.7 g ash, 12.8 g Ca.	2.34 ± 0.19
e. CL 746-P: Bowman Dairy, purchased October 3, 1955, 81.7 g ash, 11.8 g Ca.	1.92 ± 0.10
f. CL 747-P: Wanzer Dairy, purchased October 3, 1955, 57.0 g ash, 9.8 g Ca.	1.96 ± 0.09
g. CL 748-P: Borden Dairy, purchased October 3, 1955, 29.1 g ash, 4.54 g Ca.	2.34 ± 0.12
h. CL 749-P: Pure Milk Ass'n., purchased October 3, 1955, 54.7 g ash, 8.0 g Ca.	1.47 ± 0.08 NYO
i. CL 826-P: Bowman Dairy, purchased November 1, 1955, 82.7 g ash, 15.2 g Ca.	1.72 ± 0.09
j. CL 827-P: Wanzer Dairy, purchased November 1, 1955, 85.5 g ash, 14.9 g Ca.	2.34 ± 0.11

Sample	Sunshine Units
k. CL 829-P: Pure Milk Ass'n., purchased November 9, 1955, 54.2 g ash, 9.2 g Ca.	2.03 ± 0.09
l. CL 869-P: Bowman Dairy, purchased December 1, 1955, 26.8 g ash, 4.91 g Ca.	2.35 ± 0.15
m. CL 870-P: Wanzer Dairy, purchased December 1, 1955, 83.8 g ash, 12.6 g Ca.	2.58 ± 0.15
n. CL 875-P: Pure Milk Ass'n., purchased December 7, 1955, 52.8 g ash, 8.40 g Ca.	2.68 ± 0.14
o. CL 958: Borden Dairy, purchased January 3, 1956, 79.2 g ash, 11.5 g Ca.	3.12 ± 0.25
p. CL 959: Bowman Diary, purchased January 3, 1956, 25.8 g ash, 3.9 g Ca.	7.7 ± 0.4
q. CL 960: Wanzer Dairy, purchased January 3, 1956, 25.8 g ash, 4.07 g Ca.	3.2 ± 0.1
r. CL 967: Pure Milk Ass'n., purchased January 5, 1956, 55.8 g ash, 8.47 g Ca.	3.10 ± 0.09
s. CL 1014: Wanzer Dairy, purchased February 1, 1956, 21.8 g ash, 3.69 g Ca.	2.80 ± 0.08
t. CL 1015: Bowman Dairy, purchased February 1, 1956, 27.7 g ash, 4.22 g Ca.	3.6 ± 0.2
u. CL 1016: Borden Dairy, purchased February 1, 1956, 31.4 g ash, 5.06 g Ca.	3.40 ± 0.14
v. CL 1017-P: Pure Milk Ass'n., purchased February 9, 1956, 9.65 g ash, 1.38 g Ca.	2.62 ± 0.17
w. CL 1028-P: Bowman Dairy, purchased March 1, 1956, 22.2 g ash, 3.22 g Ca.	3.05 ± 0.20
x. CL 1029-P: Wanzer Dairy, purchased March 1, 1956, 62.6 g ash, 7.94 g Ca.	2.45 ± 0.13
y. CL 1030-P: Borden Dairy, purchased March 2, 1956, 24.2 g ash, 3.49 g Ca.	2.99 ± 0.29
z. CL 1031-P: Pure Milk Ass'n., purchased March 5, 1956, 52.0 g ash, 7.86 g Ca.	1.25 ± 0.12
	NYOO
aa. CL 1057-P: Bowman Dairy, purchased April 2, 1956, 47.2 g ash, 7.43 g Ca.	2.20 ± 0.13
bb. CL 1058-P: Borden Dairy, purchased April 2, 1956, 37.4 g ash, 5.68 g Ca.	3.21 ± 0.18

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7X

Sample	Sunshine Units
cc. CL 1063-P: Pure Milk Ass'n., purchased April 2, 1956, 40.3 g ash, 6.34 g Ca.	2.33 ± 0.13
dd. CL 1064-P: Wanzer Dairy, purchased April 2, 1956, 66.4 g ash, 7.40 g Ca.	2.61 ± 0.16
ee. CL 1069-P: Wanzer Dairy, purchased May 1, 1956, 23.9 g ash, 3.14 g Ca.	2.23 ± 0.13
ff. CL 1070-P: Bowman Dairy, purchased May 1, 1956, 69.6 g ash, 7.28 g Ca.	1.53 ± 0.13

2. Other United States Milks

a. Interlaboratory check sample, powdered whole, New York, furnished by Health and Safety Laboratory, New York Operations Office, U. S. Atomic Energy Commission, processed October 29, 1955.

(1) CL 889-P: 45.2 g ash, 7.12 g Ca.	2.4 ± 0.2
(2) CL 890-P: 46.2 g ash, 7.12 g Ca.	2.6 ± 0.2
(3) CL 891: 33.1 g ash, 6.62 g Ca.	2.4 ± 0.2
(4) CL 892: 44.3 g ash, 7.68 g Ca.	2.5 ± 0.2

3. Foreign, Southern Hemisphere

a. CL 694-P: Powdered skim, Waiton, New Zealand, Beltsville #551052, manufactured February 7, 1955, 88.8 g ash, 17.8 g Ca.	0.77 ± 0.07
b. CL 693-P: Powdered whole, Waiton, New Zealand, Beltsville #551051, manufactured February 8, 1955, 51.8 g ash, 11.2 g Ca.	0.70 ± 0.07

IV. Botanical

A. Chicago Milkshed: Collected by Dr. L. T. Alexander, Plant Industry Station, U. S. Department of Agriculture, Beltsville, Maryland and Dr. E. A. Martell, Enrico Fermi Institute for Nuclear Studies, University of Chicago, Chicago, Illinois, September 29 and 30, 1955.

NYOO

1. CL 754-P: Alfalfa, Swanson Farm (#3), Winnebago County, Illinois, 90.6 g ash, 11.4 g Ca.	13.6 ± 0.8
2. CL 755-P: Alfalfa, Holcomb Farm (#4), Rock County, Wisconsin, 20.8 g ash, 3.79 g Ca.	19.2 ± 1.0
3. CL 750-P: Red clover, Premo Farm (#6), Columbia County, Wisconsin, 119.4 g ash, 20.5 g Ca.	25.5 ± 1.3

Sample	Sunshine Units
4. CL 752-P: Alfalfa, Kurpeski Farm (#7), McHenry County, Illinois, 172.2 g ash, 20.4 g Ca.	7.05 ± 0.33
5. CL 757-P: Alfalfa, Austin Farm (#8), McHenry County, Illinois, 63.6 g ash, 14.6 g Ca.	38.0 ± 2.0
6. CL 751-P: Lidino clover and bromegrass mixture, McKee Farm (#9), McHenry County, Illinois, 62.6 g ash, 10.2 g Ca.	30.5 ± 1.7
7. CL 756-P: Alfalfa, Van Winkle Farm (#11), Will County, Illinois, 116.1 g ash, 15.3 g Ca.	5.76 ± 0.29
8. CL 753-P: Alfalfa, Carver Farm (#12), Will County, Illinois, 53.2 g ash, 11.2 g Ca.	2.73 ± 0.18
B. Other United States	
1. Interlaboratory check sample, Bermuda grass, Tifton, Georgia, Beltsville #551528, harvested in June 1955.	
a. CL 968-P: 124.4 g ash, 4.71 g Ca.	42.0 ± 1.9
b. CL 970: 124.4 g ash, 4.39 g Ca.	40.0 ± 2.0
2. Interlaboratory check sample, mixed hay, New York, furnished by Dr. L. Alexander, Beltsville #551513, grown during August and September 1955.	
a. CL 847-P: Cornell #3, 90.5 g ash, 12.0 g Ca.	19.7 ± 0.8
b. CL 848-P: Cornell #4, 89.7 g ash, 12.0 g Ca.	17.9 ± 0.9
3. Brawley, California: Furnished by Edward Noble, Southwestern Irrigation Field Station. Collection arrangements made by Dr. Lyle T. Alexander, Plant Industry Station, U. S. Department of Agriculture, Beltsville, Maryland, January 5, 1956.	
a. CL 1059-P: Lettuce, 57.3 g ash, 2.68 g Ca.	0.39 ± 0.05
b. CL 1060-P: Broccoli, 74.4 g ash, 7.90 g Ca.	0.25 ± 0.08
c. CL 1061-P: Peas, 56.1 g ash, 5.67 g Ca.	1.34 ± 0.08
d. CL 1062-P: Alfalfa, 49.9 g ash, 5.43 g Ca.	2.13 ± 0.22

Sample | **Sunshine Units**

V. Soil

All Soil samples listed below were obtained by Dr. L. T. Alexander and extracted at the Soil Survey Laboratory, U. S. Department of Agriculture, Beltsville, Maryland. During the Spring of 1956, the Beltsville laboratory discontinued the ammonium acetate extraction procedure in favor of electrodialysis extraction. The method of extraction is indicated for each sample. Soil Survey Laboratory analyses on these samples include the determination of Na, K, Mg, Ca and Sr.

A. Chicago Milkshed: Collected by Dr. L. Alexander, Soil Survey Laboratory, Plant Industry Station, U. S. Department of Agriculture, Beltsville, Maryland, and Dr. E. A. Martell, Enrico Fermi Institute for Nuclear Studies, University of Chicago, Chicago, Illinois, September 29 and 30, 1955.

1. CL 1019: Swanson Farm (#3), Winnebago County, Illinois, Carrington-like silt loam, Beltsville #551503, NH_4AC extraction of 4 lbs. soil, 0-8" depth, 20.0 g oxalate, 7.54 g oxide, 5.39 g Ca. — 6.83 ± 0.08

2. Holcomb Farm (#4), Rock County, Wisconsin, Carrington silt loam.

   a. CL 956: Beltsville #551500, NH_4AC extraction of 4 lbs. soil, 0-2" depth, 12.1 g oxalate, 6.82 g oxide, 3.06 g Ca. — 26.7 ± 1.0

   b. CL 957: Beltsville #551501, NH_4AC extraction of 4 lbs. soil, 2-6" depth, 12.1 g oxalate, 6.21 g oxide, 3.18 g Ca. — 3.81 ± 0.14

3. CL 1018: Preme Farm (#6), Columbia County, Wisconsin, Miami silt loam, Beltsville #551502, NH_4AC extraction of 4 lbs. soil, 0-6" depth, 11.25 g oxalate, 3.94 g oxide, 2.79 g Ca. — 15.0 ± 0.5

4. Kurpeski Farm (#7), McHenry County, Illinois, Miami silt loam.

   a. CL 886: Beltsville #551496, <u>Sample A</u>, NH_4AC extraction of 4 lbs. soil, 0-6 or 7" depth, 8.51 g oxalate, 3.21 g oxide, 2.24 g Ca. — 11.9 ± 0.5

   NYOO

   b. CL 887: Beltsville #551497, <u>Sample B</u>, NH_4AC extraction of 4 lbs. soil, 0-6 or 7" depth, 8.90 g oxalate, 3.35 g oxide, 2.36 g Ca. — 12.6 ± 0.5

Sample — **Sunshine Units**

5. Austin Farm (#8), McHenry County, Illinois, Miami silt loam.

   a. CL 1020: Beltsville #551504, NH_4AC extraction of 4 lbs. soil, 0-2" depth, 5.71 g oxalate, 2.21 g oxide, 1.57 g Ca. — 49.9 ± 1.5

   b. CL 1021: Beltsville #551505, NH_4AC extraction of 4 lbs. soil, 2-6" depth, 4.08 g oxalate, 1.6 g oxide, 1.19 g Ca. — 9.6 ± 0.4

6. McKee Farm (#9), McHenry County, Illinois, Drummer silty clay loam.

   a. CL 888: Beltsville #551498, NH_4AC extraction of 4 lbs. soil, 0-2" depth, 30.25 g oxalate, 11.31 g oxide, 7.04 g Ca. — 9.8 ± 0.4

   b. CL 955: Beltsville #551499, NH_4AC extraction of 4 lbs. soil, 2-6" depth, 30.6 g oxalate, 17.44 g oxide, 7.91 g Ca. — 0.99 ± 0.04

7. Van Winkle Farm (#11), Will County, Illinois, Plainfield sand.

   a. CL 1022: Beltsville #551508, NH_4AC extraction of 4 lbs. soil, 0-2" depth, 4.31 g oxalate, 1.66 g oxide, 1.19 g Ca. — 65.1 ± 2.6

   b. CL 1023: Beltsville #551509, NH_4AC extraction of 4 lbs. soil, 2-6" depth, 2.44 g oxalate, 0.94 g oxide, 0.67 g Ca. — 10.0 ± 0.4

8. Carver Farm (#12), Will County, Illinois, Plainfield sand.

   a. CL 1024: Beltsville #551510, NH_4AC extraction of 4 lbs. soil, 0-2" depth, 4.43 g oxalate, 1.70 g oxide, 1.22 g Ca. — 64.5 ± 1.3

   b. CL 1025: Beltsville #551511, NH_4AC extraction of 4 lbs. soil, 2-6" depth, 2.98 g oxalate, 1.15 g oxide, 0.87 g Ca. — 14.0 ± 0.7

B. Other United States Soils

1. Interlaboratory check sample, Ithaca, New York, September 15, 1955, electrodialysis extraction of 4 lbs. soil, 0-2" depth. — NYOO

   a. CL 1039: Beltsville #551186A, 18.28 g oxalate, 6.93 g oxide, 4.96 g Ca. — 21.5 ± 1.3

Sample	Sunshine Units
b. CL 1040-P: Beltsville #551186B, 18.22 g oxalate, 6.84 g oxide, 4.89 g Ca.	17.8 ± 1.0
2. Interlaboratory check sample, Tifton, Georgia, November 2, 1955, electrodialysis extraction of 4 lbs. soil, 0-4" depth.	
a. CL 1041-P: Beltsville #551523A, 0.698 g oxalate, 0.26 g oxide, 0.186 g Ca.	164 ± 12
b. CL 1042: Beltsville #551523B, 0.59 g oxalate, 0.22 g oxide, 0.16 g Ca.	178.2 ± 7.1
3. CL 1127: Brawley, California, Beltsville #56316, collected January 5, 1956, electrodialysis extraction of 4 lbs. soil, 0-6" depth, 16.56 g oxalate, 6.35 g oxide, 4.54 g Ca.	≤ 0.8
C. Foreign, Northern Hemisphere	
1. CL 1065: England, Beltsville #54675B, obtained by Dr. L. Alexander in July 1954, extracted by fusion of a 100 gram subsample of a 4 lb. electrodialyzed soil sample, 0-3" depth, 4.15 g oxalate, 1.59 g oxide, 0.136 g Ca. (1.2 ± 0.3 dpm Sr^{90} total sample activity.)	4 ± 1
2. CL 1095-P: Calcareous, Paris, France, Beltsville #55614, obtained by Dr. L. Alexander, February 16, 1955, electrodialysis extraction of 4 lbs. soil, 0-4" depth, 29.30 g oxalate, 11.06 g oxide, 7.90 g Ca.	0.69 ± 0.05
3. CL 881: Italy, Beltsville #55772, obtained by Dr. L. Alexander, February 5, 1955, NH_4AC extraction of 4 lbs. soil, 0-4" depth, 43.1 g oxalate, 16.54 g oxide, 11.5 g Ca.	1.64 ± 0.05
4. CL 882: Turkey, Beltsville #55877, obtained by Dr. L. Alexander, February 7, 1955, NH_4AC extraction of 4 lbs. soil, 0-4" depth, 44.6 g oxalate, 16.96 g oxide, 12.0 g Ca.	1.28 ± 0.07
5. CL 883: Turkey, Beltsville #551284, obtained by Dr. L. Alexander, February 28, 1954, NH_4AC extraction of 4 lbs. soil, 0-2" depth, 42.8 g oxalate, 16.31 g oxide, 11.5 g Ca.	2.44 ± 0.13
6. CL 884: Turkey, Beltsville #551285, obtained by Dr. L. Alexander, February 28, 1954, NH_4AC extraction of 4 lbs. soil, 0-2" depth, 47.5 g oxalate, 18.28 g oxide, 12.8 g Ca.	1.52 ± 0.05

NYOO

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	Sample	Sunshine Units
7.	CL 885: Turkey, Beltsville #551286, obtained by Dr. L. Alexander, February 28, 1954, NH_4AC extraction of 4 lbs. soil, 0-2" depth, 53.9 g oxalate, 20.67 g oxide, 13.6 g Ca.	1.29 ± 0.06
8.	CL 1046-P: Calcareous, Kohler Yard, Turkey, Beltsville #55878A, obtained by Dr. L. Alexander, February 7, 1955, electrodialysis extraction (48 hour period) of 4 lbs. soil, 0-4" depth, 17.11 g oxalate, 5.50 g oxide, 4.72 g Ca.	2.4 ± 0.2
9.	CL 1047-P: Calcareous, Kohler Yard, Turkey, Beltsville #55878B, obtained by Dr. L. Alexander, February 7, 1955, electrodialysis extraction (additional 24 hour period) of 4 lbs. soil, 0-4" depth, 10.64 g oxalate, 4.03 g oxide, 2.88 g Ca.	1.01 ± 0.12
10.	CL 1094-P: Calcareous, Damascus Syria, Beltsville #55590, obtained by Dr. L. Alexander, February 11, 1955, electrodialysis extraction of 4 lbs. soil, 0-4" depth, 20.30 g oxalate, 7.70 g oxide, 5.50 g Ca.	1.40 ± 0.10
11.	CL 1048-P: Calcareous, Beirut, Lebanon, Beltsville #55591A, obtained by Dr. L. Alexander, February 10, 1955, electrodialysis extraction (48 hour period) of 4 lbs. soil, 0-4" depth, 14.05 g oxalate, 5.35 g oxide, 3.83 g Ca.	4.4 ± 0.2
12.	CL 1049-P: Calcareous, Beirut, Lebanon, Beltsville #55591B, obtained by Dr. L. Alexander, February 10, 1955, electrodialysis extraction (additional 24 hour period) of 4 lbs. soil, 0-4" depth, 9.0 g oxalate, 3.41 g oxide, 2.44 g Ca.	1.22 ± 0.13
13.	CL 1050-P: Calcareous, Terbol, Lebanon, Beltsville #55592A, obtained by Dr. L. Alexander, February 10, 1955, electrodialysis extraction (48 hour period) of 4 lbs. soil, 0-4" depth, 16.68 g oxalate, 6.31 g oxide, 4.52 g Ca.	2.04 ± 0.13
14.	CL 1051-P: Calcareous, Terbol, Lebanon, Beltsville #55592B, obtained by Dr. L. Alexander, February 10, 1955, electrodialysis extraction (additional 24 hour period) of 4 lbs. soil, 0-4" depth, 10.32 g oxalate, 3.91 g oxide, 2.8 g Ca.	1.56 ± 0.12 NYOO
15.	CL 1140-P: Aden, Saudi Arabia, Beltsville #55786, obtained by Dr. L. Alexander, February 1955, electrodialysis extraction of 4 lbs. soil, 0-4" depth, 13.99 g oxalate, 5.45 g oxide, 3.69 g Ca.	1.02 ± 0.06

Sample	Sunshine Units
16. CL 1099-P: Calcareous, Algeria, Beltsville #55647, obtained by Dr. L. Alexander, February 15, 1955, electrodialysis extraction of 4 lbs. soil, 0-4" depth, 20.0 g oxalate, 7.57 g oxide, 5.41 g Ca.	1.20 ± 0.08
17. CL 1100-P: Calcareous, Algeria, Beltsville #55648, obtained by Dr. L. Alexander, February 15, 1955, electrodialysis extraction of 4 lbs. soil, 0-4" depth, 26.75 g oxalate, 10.16 g oxide, 7.26 g Ca (less 1 g Ca added during last step of electrodialysis procedure).	2.90 ± 0.20
18. CL 1098-P: Dakar, F.W. Africa, Beltsville #55645, obtained by Dr. L. Alexander, February 13, 1955, electrodialysis extraction of 4 lbs. soil, 0-4" depth, 8.66 g oxalate, 3.26 g oxide, 2.33 g Ca (less 1 g Ca added during last step of electrodialysis procedure).	3.71 ± 0.14
19. CL 1136-P: Dakar, F.W. Africa, Beltsville #55646, obtained by Dr. L. Alexander, February 14, 1955, electrodialysis extraction of 4 lbs. soil, 0-4" depth, 4.38 g oxalate, 1.75 g oxide, 1.27 g Ca (less 1 g Ca added during last step of electrodialysis procedure).	9.31 ± 0.74
20. CL 1137-P: New Delhi, India, Beltsville #55672, obtained by Dr. L. Alexander, February 14, 1955, electrodialysis extraction of 4 lbs. soil, 0-4" depth, 29.99 g oxalate, 11.45 g oxide, 8.03 g Ca.	0.40 ± 0.02
21. CL 1138-P: New Delhi, India, Beltsville #55673, obtained by Dr. L. Alexander, February 14, 1955, electrodialysis extraction of 4 lbs. soil, 0-4" depth, 35.5 g oxalate, 13.62 g oxide, 9.61 g Ca.	0.64 ± 0.05
22. CL 1096-P: Tokyo, Japan, Beltsville #55643, obtained by Dr. L. Alexander, February 10, 1955, electrodialysis extraction of 4 lbs. soil, 0-4" depth, 4.997 g oxalate, 1.89 g oxide, 1.35 g Ca.	3.74 ± 0.34
23. CL 1097-P: Tokyo, Japan, Beltsville #55644, obtained by Dr. L. Alexander, February 10, 1955, electrodialysis extraction of 4 lbs. soil, 0-4" depth, 5.74 g oxalate, 2.17 g oxide, 1.55 g Ca.	5.86 ± 0.29

D. Foreign, Southern Hemisphere

Sample	Sunshine Units
1. CL 1044-P: Brazil, Beltsville #54288, obtained by Dr. L. Alexander, March 2, 1954, NH_4AC extraction of 4 lbs. soil, 0-4" depth, 0.32 g oxalate, 0.12 g oxide, 0.09 g Ca.	5.3 ± 2.1

Sample	Sunshine Units
2. CL 1045-P: Brazil, Beltsville #54289, obtained by Dr. L. Alexander, March 2, 1954, NH_4AC extraction of 4 lbs. soil, 0-4" depth, 0.99 g oxalate, 0.38 g oxide, 0.27 g Ca.	7.1 ± 0.7
3. CL 1135-P: São Paulo, Brazil, Beltsville #56448, obtained by Dr. L. Alexander, January 30, 1956, electrodialysis extraction of 4 lbs. soil, 0-6" depth, 7.32 g oxalate, 2.90 g oxide, 1.96 g Ca.	3.04 ± 0.27
4. CL 1129: Lima Peru, Beltsville #56456, obtained by Dr. L. Alexander, January 9, 1956, electrodialysis extraction of 4 lbs. soil, 0-6" depth, 15.57 g oxalate, 6.01 g oxide, 4.29 g Ca.	0.60 ± 0.04
5. CL 1128: Antofagasta, Chile, Beltsville #56447, obtained by Dr. L. Alexander, January 13, 1956, electrodialysis extraction of 4 lbs. soil, 0-½" depth, 9.35 g oxalate, 3.58 g oxide, 2.56 g Ca.	0.44 ± 0.04
6. CL 1134-P: Asuncion, Paraguay, Beltsville #56450, obtained by Dr. L. Alexander, January 27, 1956, electrodialysis extraction of 4 lbs. soil, 0-6" depth, 5.79 g oxalate, 2.42 g oxide, 1.53 g Ca (less 1 g Ca added during last step of electrodialysis procedure).	11.3 ± 0.75
7. CL 1139-P: Durban, Natal, S. Africa, Beltsville #55777, obtained by Dr. L. Alexander, February 15, 1955, electrodialysis extraction of 4 lbs. soil, 0-4" depth, 6.42 g oxalate, 2.55 g oxide, 1.69 g Ca.	4.43 ± 0.19

VI. Precipitation

A. Chicago, Illinois: Samples were collected in galvanized tubs placed on the roof of Jones Chemistry Laboratory, University of Chicago. For all samples, the equivalent precipitation in inches derived from sample volume and collection area is given.

	dpm/gal
1. CL 290: Rain, 0.264 gal., 0.143" equivalent, collected October 15, 1954 to October 18, 1954.	10.3 ± 0.3
2. CL 382: Rain, 1.62 gal., 0.82" equivalent, collected 1645, December 31, 1954 to 0700, January 6, 1955.	4.8 ± 0.4
3. CL 356, 357 & 358: Snow, 0.304 gal., 0.16" equivalent, collected January 25, 1955 to February 3, 1955.	21.2 ± 2.1

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	Sample	dpm/gal
4.	CL 383: Snow, 1.17 gal., 0.60" equivalent, collected 0400, February 3, 1955 to 1500, February 10, 1955.	5.9 ± 0.8
5.	CL 436-P: Rain and hail, 0.526 gal., 0.27" equivalent, collected 1445, March 3, 1955 to 1000, March 4, 1955.	29.6 ± 4.8
6.	CL 419-P: Rain, 1.53 gal., 0.78", collected 1400, March 7, 1955 to 1430, March 21, 1955. ("wet" tub)*	48.5 ± 3.0
7.	CL 461-P: Rain, 1.04 gal., 0.53", collected 1530, March 10, 1955 to 0900, March 16, 1955. ("wet" tub)*	42.2 ± 2.0
8.	CL 477-P: Rain and snow, 1.68 gal., 0.86", collected 1530, March 21, 1955 to 1000, April 4, 1955. ("wet" tub)*	21.0 ± 1.6
9.	CL 592-P: Rain, 1.0 gal., 0.51" equivalent, collected 0730, April 21, 1955 to 1715, April 26, 1955.	42 ± 2
10.	CL 617-P: Rain, 0.098 gal., 0.05" equivalent, collected 1800, April 28, 1955 to 0930, May 13, 1955.	685 ± 72
11.	CL 618-P: Rain, 0.43 gal., 0.22" equivalent, collected 1800, April 28, 1955 to 0930, May 13, 1955. (covered tub)*	193 ± 21
12.	CL 619-P: Rain, 0.548 gal., 0.28", collected 1800, April 28, 1955 to 0930, May 13, 1955. ("wet" tub)*	133 ± 9
13.	CL 627-P: Rain, 0.85 gal., 0.43" equivalent, collected 1100, May 13, 1955 to 1130, May 23, 1955.	106 ± 6
14.	CL 628-P: Rain, 0.90 gal., 0.46" equivalent, collected 1100, May 13, 1955 to 1130, May 23, 1955. (covered tub)*	78 ± 5
15.	CL 645-P: Rain, 3.48 gal., 1.78" equivalent, collected 1700, May 23, 1955 to 1030, June 6, 1955. (covered tub)*	69 ± 3
16.	CL 646-P: Rain, 4.94 gal., 2.52", collected 1700, May 23, 1955 to 1030, June 6, 1955. ("wet" tub)*	44.8 ± 1.6
17.	CL 648-P: Rain, 0.77 gal., 0.39" equivalent, collected 1700, May 23, 1955 to 1030, June 6, 1955.	270 ± 12
18.	CL 647-P: Rain, 0.35 gal., 0.18" equivalent, collected 1200, June 6, 1955 to 1245, June 7, 1955.	22 ± 5
19.	CL 649-P: Rain, 0.37 gal., 0.19" equivalent, collected 1245, June 7, 1955 to 0950, June 9, 1955.	60 ± 3

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	Sample	dpm/gal
20.	CL 661-P: Rain, 1.12 gal., 0.57" equivalent, collected 0950, June 9, 1955 to 1035, June 10, 1955.	52 ± 3
21.	CL 692-P: Rain, 2.38 gal., 1.21" equivalent, collected 1200, June 14, 1955 to 1030, July 25, 1955.	42 ± 2
22.	CL 705-P: Rain, 7.16 gal., 3.67" equivalent, collected 1030, July 25, 1955 to 1400, August 7, 1955.	2.8 ± 0.2
23.	CL 706-P: Rain, 0.435 gal., 0.22" equivalent, collected 1400, August 7, 1955 to 1100, August 22, 1955.	30.5 ± 2.3
24.	CL 727: Rain, 4.29 gal., 0.22" equivalent, collected 1100, August 22, 1955 to 0900, August 30, 1955.	1.74 ± 0.10
25.	CL 743-P: Rain, 0.66 gal., 0.34" equivalent, collected 1100, August 30, 1955 to 1350, September 21, 1955.	24.0 ± 1.7
26.	CL 744-P & 745-P: Rain, 2.07 gal., 1.06" equivalent, collected 1350, September 21, 1955 to 1458, September 29, 1955.	8.6 ± 2.0
27.	CL 761-P: Rain, 1.97 gal., 1.00" equivalent, collected 1458, September 29, 1955 to 1611, October 5, 1955.	2.2 ± 0.3
28.	CL 762-P: Rain, 2.83 gal., 1.44" equivalent, collected 1611, October 5, 1955 to 1033, October 6, 1955.	5.3 ± 0.5
29.	CL 763-P: Rain, 3.42 gal., 1.75" equivalent, collected 1033, October 6, 1955 to 1110, October 7, 1955.	4.70 ± 0.29
30.	CL 771-P: Rain, 1.07 gal., 0.55" equivalent, collected 1110, October 7, 1955 to 1027, October 12, 1955.	9.02 ± 0.52
31.	CL 772-P: Rain, 1.16 gal., 0.59" equivalent, collected 1027, October 12, 1955 to 1021, October 17, 1955.	8.4 ± 0.5
32.	CL 799-P: Rain, 0.79 gal., 0.40" equivalent, collected 1021, October 17, 1955 to 0811, October 24, 1955.	26.5 ± 1.5
33.	CL 825-P: Rain, 1.04 gal., 0.53" equivalent, collected 0811, October 24, 1955 to 1010, October 31, 1955.	10.1 ± 0.5

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Sample	dpm/gal
34. CL 828-P & 830-P: Rain, 1.84 gal., 0.94" equivalent, collected 1010, October 31, 1955 to 1030, November 17, 1955.	21.0 ± 1.0
35. CL 831-P: Snow, 0.535 gal., 0.27" equivalent, collected 1030, November 17, 1955 to 0949, November 21, 1955.	22.3 ± 1.0
36. CL 837-P: Rain, 0.147 gal., 0.075" equivalent, collected 0949, November 21, 1955 to 0920, November 23, 1955.	36.0 ± 4.7
37. CL 840-P: Snow, 0.122 gal., 0.062" equivalent, collected 0920, November 23, 1955 to 1055, November 28, 1955.	11.7 ± 2.7
38. CL 871-P: Snow, 0.116 gal., 0.059" equivalent, collected 1055, November 28, 1955 to 1100, December 2, 1955.	28.6 ± 3.4
39. CL 872-P: Snow, 0.31 gal., 0.16" equivalent, collected 1100, December 2, 1955 to 1120, December 5, 1955.	19.0 ± 1.4
40. CL 954-P: Snow, 0.15 gal., 0.077" equivalent, collected 1120, December 5, 1955 to 0800, December 21, 1955.	53 ± 7
41. CL 976-P: Snow, 0.082 gal., 0.042" equivalent, collected 0800, December 21, 1955 to 1115, January 16, 1956.	440 ± 25

* See discussion, "Test of Rain Collection Method," page 13 of this report.

B. Insoluble Residue from Chicago Rains

1. Insoluble residue from rain, CL 320: 1.82 gal., 0.930" equivalent, collected December 24, 1954 to December 27, 1954. The filtered insoluble residue was fused with sodium carbonate before assay.

   Total Sr^{90} activity insoluble residue: ≤0.6 dpm
   Total Sr^{90} activity in solution: 49.2 ± 0.5 dpm

2. Insoluble residue from rain, CL 407 & 408: 0.71 gal., 0.36" equivalent, collected February 18, 1955 to 0900, February 21, 1955. The filtered insoluble residue was fused with sodium carbonate before assay.

   Total Sr^{90} activity insoluble residue: 0.7 ± 0.1 dpm
   Total Sr^{90} activity in solution: 29.9 ± 1.5 dpm

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Sample	dpm/gal
C. Washington, D. C.: Collected at the Naval Research Laboratory. Samples were taken by direct fall into galvanized tubs on the roof of one of the NRL buildings. The precipitation in inches is that reported by the local Weather Bureau station for the period of sample collection.	
1. CL 790: Rain, 2.40 gal., 0.61", collected 2000, April 11, 1955 to 0400, April 12, 1955.	34.3 ± 1.4
2. CL 791-P: Rain, 2.92 gal., 0.68", collected 0030 to 1500, April 14, 1955.	25.6 ± 3.5
3. CL 792: Rain, 0.845 gal., 0.21", collected 2315 to 2400, April 14, 1955.	39.0 ± 1.7
4. CL 793-P: Rain, 1.60 gal., 0.23", collected 2100, April 21, 1955 to 0245, April 22, 1955.	46.7 ± 2.2
5. CL 794: Rain, 0.697 gal., 0.21", collected 0415, April 24, 1955 to 0300, April 25, 1955.	195.0 ± 4.3
6. CL 795-P: Rain, 2.30 gal., 0.39", collected 1500, April 25, 1955 to 0700, April 26, 1955.	15.5 ± 0.6
7. CL 797: Rain, 0.771 gal., 0.19", collected 1630 to 2030, May 20, 1955.	112.9 ± 2.0
8. CL 798-P: Rain, 1.17 gal., 0.29", collected 1245 to 1400, May 22, 1955.	1.92 ± 0.22
D. Pittsburgh, Pennsylvania: Collected by the Nuclear Science and Engineering Corporation. Samples were taken by direct fall into galvanized tubs on the roof of the laboratory building. The precipitation in inches is that reported by the local Weather Bureau station for the period of sample collection.	
1. CL 876-P: Rain, PL-20-RW, 2.47 gal., 0.48", collected 1200, July 10, 1955 to 1000, July 19, 1955.	16.6 ± 1.5
2. CL 877-P: Rain, PL-21-RW, 5.70 gal., 0.65", collected 1000, July 19, 1955 to 1100, July 25, 1955.	18.8 ± 1.4
3. CL 878-P: Rain, PL-22-RW, 4.40 gal., 0.60", collected 1100, July 25, 1955 to 0900, July 28, 1955.	8.2 ± 0.5
4. CL 879-P: Rain, PL-23-RW, 1.98 gal., 0.18", collected 0900, July 28, 1955 to 1000, August 6, 1955.	8.7 ± 1.0
5. CL 961-P: Rain, PL-24-RW, 0.86 gal., 0.18", collected 1000, August 6, 1955 to 1500, August 8, 1955.	10.8 ± 1.0
6. CL 962-P: Rain, PL-25-RW, 4.91 gal., 1.98", collected 1500, August 8, 1955 to 1630, August 11, 1955.	5.55 ± 0.32

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	Sample	dpm/gal
7.	CL 982-P: Rain, PL-26-RW, 7.6 gal., 2.24", collected 1630, August 11, 1955 to 1030, August 16, 1955.	31 ± 3
8.	CL 983-P: Rain, PL-27-RW, 4.0 gal., 1.71", collected 1030, August 16, 1955 to 1700, August 23, 1955.	83 ± 5
9.	CL 963-P: Rain, PL-28-RW, 0.395 gal., 0.66", collected 1700, August 23, 1955 to 1600, August 31, 1955.	31.6 ± 2.6
10.	CL 964-P: Rain, PL-29-RW, 4.4 gal., 1.84", collected 1600, August 31, 1955 to September 28, 1955.	9.75 ± 0.59
11.	CL 965-P: Rain, PL-30-RW, 2.0 gal., 0.76", collected September 28, 1955 to October 10, 1955.	10.7 ± 0.6
12.	CL 966-P: Rain, PL-31-RW, 3.9 gal., 1.32", collected October 10, 1955 to October 18, 1955.	14.2 ± 0.6
13.	CL 984-P: Rain, PL-32-RW, 0.465 gal., 0.09", collected October 18, 1955 to October 20, 1955.	34.0 ± 1.6
14.	CL 985-P: Rain, PL-33-RW, 1.14 gal., 0.42", collected October 20, 1955 to 1615, October 24, 1955.	16.1 ± 0.8
15.	CL 986-P: Rain, PL-34-RW, 0.508 gal., 0.28", collected 1615, October 24, 1955 to 1700, October 29, 1955.	50.5 ± 2.5
16.	CL 987-P: Rain, PL-35-RW, 0.715 gal., 0.40", collected 1700, October 29, 1955 to 0845, October 31, 1955.	38.4 ± 1.9
17.	CL 988-P: Rain, PL-36-RW, 0.465 gal., 0.31", collected 0845, October 31, 1955 to 1630, November 12, 1955.	60.0 ± 2.9
18.	CL 989-P: Rain, PL-37-RW, 0.402 gal., 0.08", collected 1630, November 12, 1955 to 1630, November 14, 1955.	22.6 ± 1.4
19.	CL 990-P: Rain, PL-38-RW, 6.18 gal., 2.25", collected 1630, November 14, 1955 to 1100, November 21, 1955.	4.43 ± 0.19
20.	CL 1032-P: Rain, PL-39-RW, 2.06 gal., 0.35", collected 1100, November 21, 1955 to 1400, December 3, 1955.	17.0 ± 1.0
21.	CL 991-P: Rain, PL-40-RW, 0.0238 gal., 0.07", collected 1400, December 3, 1955 to 1400, December 14, 1955.	319 ± 24

Sample	dpm/gal
22. CL 1033-P: Rain, PL-41-RW, 0.025 gal., 0.05", collected 1400, December 14, 1955 to 1400, December 24, 1955.	520 ± 60
23. CL 1066-P: Rain, PL-42-RW, 4.34 gal., 2.63", collected 1400, December 24, 1955 to 1600, February 3, 1956.	29 ± 3
24. CL 1068-P: Rain, PL-43-RW, 6.05 gal., 2.10", collected 1600, February 3, 1956 to 1000, February 13, 1956.	16.9 ± 1.3
25. CL 1089-P: Rain, PL-44-RW, 4.10 gal., 2.95", collected 1000, February 13, 1956 to 1400, February 27, 1956.	32.2 ± 1.9
26. CL 1090-P: Rain, PL-45-RW, 4.55 gal., 0.76", collected 1400, February 27, 1956 to March 6, 1956.	52 ± 3
27. CL 1091-P: Rain, PL-46-RW, 6.60 gal., 3.13", collected 1800, March 6, 1956 to 1200, March 24, 1956.	28 ± 2
28. CL 1092-P: Rain, PL-47-RW, 2.55 gal., 1.21", collected 1200, March 24, 1956 to 1000, April 1, 1956.	47 ± 4

VII. Water Other than Precipitation

A. CL 1093-P: Tap water, PL-51-TW, 13.2 gal., Pittsburgh, Pennsylvania, collected by Nuclear Science and Engineering Corporation, March 2, 1956 to March 13, 1956. — 1.33 ± 0.14

B. CL 732: Sea water, surface sample, 40 liters, Atlantic Ocean, collected at 43°49'N, 48°07'W, by U. S. Coast Guard, Station 5844, April 28, 1955. (Depth of thermocline ~100 meters)

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Total Sr^{90} Activity: 4.3 ± 0.3 dpm

VIII. Air Concentration

Air filter samples provided by Mr. I. H. Blifford, Naval Research Laboratory, Washington, D. C. Collections were made on Army Chemical Corps Type V filters of 200 square inches area and of heavy asbestos fiber composition.

A. Sr^{90} Surface Air Concentration, Washington, D. C.

CL No.	Collection Period	Volume ($ft^3 \times 10^{-6}$)	DPM $Sr^{90}/10^6 ft^3$
204D	April 5-8, 1953	4.5	18.6 ± 0.7
204A	October 2-6, 1953	1.7	41.1 ± 3.0
204B	October 6-9, 1953	3.4	30.5 ± 1.1
130	October 12-15, 1953	3.4	70 ± 12
514-P	April 3-5, 1954	2.92	91 ± 7
204E	April 8-10, 1954	2.6	6.4 ± 0.2
204C	April 9-11, 1954	1.7	125 ± 5
204F	April 10-12, 1954	3.4	258 ± 6
515-P	April 12-14, 1954	1.95	65.5 ± 4.6
204G	April 15-17, 1954	3.7	11.0 ± 0.5
204H3	April 17-19, 1954	2.8	20.7 ± 0.6
516-P	Apr. 29-May 1, 1954	3.0	32.2 ± 2.6
895-P	May 5-7, 1954	2.33	210 ± 12
517-P	May 11-13, 1954	2.76	31.3 ± 2.2
896-P	May 17-19, 1954	2.59	120 ± 7
518-P	May 24-26, 1954	2.61	216 ± 11
897-P	May 28-30, 1954	3.80	133 ± 7
519-P	June 1-3, 1954	2.90	68.3 ± 4.1
898-P	June 14-17, 1954	4.45	79 ± 6
899-P	June 23-26, 1954	3.79	51 ± 3
520-P	July 16-17, 1954	1.88	47.0 ± 2.4
521-P	July 24-26, 1954	2.56	73.5 ± 5.2

CL No.	Collection Period	Volume ($ft^3 x 10^{-6}$)	DPM $Sr^{90}/10^6 ft^3$
522-P	July 26-29, 1954	3.66	48.0 ± 3.9
900-P	July 30-Aug. 2, 1954	2.95	200 ± 10
901-P	August 2-7, 1954	5.41	59 ± 5
902-P	August 7-9, 1954	2.92	210 ± 13
903-P	August 28-29, 1954	1.82	380 ± 25
904-P	October 1-3, 1954	3.39	112 ± 7
905-P	October 5-8, 1954	3.56	104 ± 6
906-P	October 16-18, 1954	2.69	198 ± 14
907-P	October 26-28, 1954	2.26	251 ± 17
401-P	November 1-3, 1954	2.9	120 ± 7
908-P	November 7-8, 1954	1.15	225 ± 14
909-P	November 15-16, 1954	1.28	175 ± 10
910-P	November 22-24, 1954	1.96	194 ± 11
402-P	December 1-2, 1954	1.6	103 ± 4
411-P	January 3-4, 1955	1.26	281 ± 6
412-P	February 5-6, 1955	1.7	127 ± 5
413-P	February 10-12, 1955	2.9	241 ± 10
913-P	February 17-18, 1955	1.51	191 ± 11
523-P	February 22-23, 1955	1.41	202 ± 11
524-P	March 3-4, 1955	1.76	270 ± 13
525-P	March 7-8, 1955	1.54	394 ± 20
526-P	March 13-14, 1955	1.07	267 ± 16
527-P	March 16-17, 1955	1.62	310 ± 15
914-P	March 21-23, 1955	2.27	98 ± 7
528-P	March 22-23, 1955	1.74	393 ± 20
529-P	March 27-28, 1955	1.80	24 ± 5

CL No.	Collection Period	Volume ($ft^3 x 10^{-6}$)	DPM $Sr^{90}/10^6 ft^3$
773-P	April 4-5, 1955	1.32	84 ± 4
774-P	April 11-12, 1955	1.93	71.5 ± 3.3
775-P	April 18-19, 1955	2.27	65 ± 6
776-P	April 25-26, 1955	1.82	22.5 ± 1.4
777-P	May 2-3, 1955	1.34	709 ± 52
778-P	May 10-11, 1955	1.54	265 ± 12
779-P	May 17-18, 1955	1.37	478 ± 16
780-P	May 24-25, 1955	1.69	755 ± 33
917-P	June 16-17, 1955	1.43	710 ± 40
918-P	August 5-8, 1955	3.0	300 ± 20
919-P	August 12-16, 1955	4.51	49 ± 4
920-P	August 19-22, 1955	3.5	124 ± 6
921-P	August 26-29, 1955	3.6	226 ± 16
922-P	September 26-27, 1955	1.53	158 ± 9
923-P	September 29-30, 1955	1.69	124 ± 8

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B. Sr^{90} Surface Air Concentration, Foreign Locations

There is considerable uncertainty in the air volumes of samples collected at Kodiak, T.A., Port Lyautey, F.M., and Yokosuka, Japan because the flow rate is not directly recorded. For the earliest reports of air filter data for these three locations, the rated flow rate times the total collection period was taken as the collected air volume. Because the flow rate falls off substantially as dust accumulates on the filter, those samples were overestimated in volume and thus the reported air concentration data were too low. It is considered that a better estimate of their air volume is provided by the average Washington, D. C. volumes for equivalent collection periods. On this basis, the relative air concentration data should be considerably improved, although their absolute value may be in error by as much as 50% or so. All the earlier reported air filter data for Kodiak, Port Lyautey and Yokosuka have been estimated on this basis, and the new results are presented below.

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1. Kodiak, T. A.

CL No.	Collection Period	Volume ($ft^3 x 10^{-6}$)	DPM $Sr^{90}/10^6 ft^3$
924-P	May 27-June 3, 1952	~4.4	~4.8
926-P	June 5-July 1, 1952	~4.5	~6.7
925-P	June 11-17, 1952	~4.3	~9.5
927-P	July 8-16, 1952	~4.4	~6.8
928-P	July 24-29, 1952	~4.2	~4.9
929-P	Aug. 29-Sept. 4, 1952	~4.2	~1.1
930-P	Sept. 18-25, 1952	~4.2	~1.1
931-P	October 9-16, 1952	~4.2	< 1.0
932-P	October 23-30, 1952	~4.2	0.7 ± 0.2
131	November 18-23, 1953	~4.2	~50
205C	February 9-15, 1954	~4.3	~27
205D2	February 15-18, 1954	~3.6	~2.2
205E	February 18-22, 1954	~4.0	~10
933-P	March 17-22, 1954	~4.2	~36
934-P	April 19-26, 1954	~4.4	~61
935-P	May 17-24, 1954	~4.4	~48
936-P	June 14-21, 1954	~4.4	~90
937-P	July 19-26, 1954	~4.4	~31
939-P	September 24-26, 1954	~3.0	~35
940-P	October 15-18, 1954	~3.6	~6.1
403-P	Oct. 30-Nov. 1, 1954	~3.0	~21
941-P	November 20-22, 1954	~3.0	~17
404-P	December 1-2, 1954	~1.9	~180
942-P	December 16-19, 1954	~3.6	~74
414-P	January 1-2, 1955	~1.9	~240

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CL No.	Collection Period	Volume ($ft^3 x 10^{-6}$)	DPM $Sr^{90}/10^6 ft^3$
415-P	February 1-2, 1955	~1.9	~230
535-P	March 1-3, 1955	~3.0	~71
781-P	April 1-3, 1955	~3.0	~200
782-P	April 30-May 2, 1955	~3.0	~62
783-P	June 30-July 1, 1955	~1.9	~180
943-P	August 5-7, 1955	~3.0	~53
944-P	September 1-3, 1955	~3.0	~140
2. Port Lyautey, F. M.			
206B	July 9-11, 1953	~3.0	~14
206C	July 11-13, 1953	~3.0	~54
206D	July 13-16, 1953	~3.6	~15
206A2	Sept. 30-Oct. 1, 1953	~1.9	~22
206E1	November 2-9, 1953	~4.4	~26
405-P	November 8-9, 1954	~1.9	~140
949-P	November 21-22, 1954	~1.9	~180
406-P	December 3-4, 1954	~1.9	~200
416-P	January 4-6, 1955	~3.0	~53
530-P	Feb. 28-March 2, 1955	~3.0	~500
531-P	March 6-8, 1955	~3.0	~390
532-P	March 16-18, 1955	~3.0	~280
533-P	March 22-24, 1955	~3.0	~110
784-P	April 1-3, 1955	~3.0	~390
950-P	April 15-17, 1955	~3.0	~590
785-P	May 1-3, 1955	~3.0	~640
951-P	May 15-17, 1955	~3.0	~150
786-P	May 31-June 2, 1955	~3.0	~1300

CL No.	Collection Period	Volume ($ft^3 x 10^{-6}$)	DPM $Sr^{90}/10^6 ft^3$
952-P	June 14-16, 1955	~3.0	~310
953-P	June 29-July 1, 1955	~3.0	~130

3. Yokosuka, Japan

CL No.	Collection Period	Volume ($ft^3 x 10^{-6}$)	DPM $Sr^{90}/10^6 ft^3$
417-P	February 1-3, 1955	~3.0	~150
534-P	March 1-3, 1955	~3.0	~200
787-P	April 1-3, 1955	~3.0	~12
788-P	May 1-3, 1955	~3.0	~270
789-P	June 1-3, 1955	~3.0	~110
945-P	August 1-3, 1955	~3.0	~14
946-P	August 15-17, 1955	~3.0	~170
947-P	September 1-3, 1955	~3.0	~12
948-P	September 23-25, 1955	~3.0	~70

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