water diatoms from the mouth of African streams were entrapped in fine sediments, "a flocculent which then moved downslope. . . ." Is it possible that this flocculent mass could travel with a turbidity current and be deposited at a distance of more than 900 km from the African coast? This seems highly improbable, and, to my knowledge, there are no records to support this hypothesis. Regarding the breaks of submarine cables off the Great Banks in 1929, which Rigby and Burckle mention, the Swedish oceanographer B. Kullenberg (*2*) has pointed out that the breaks could not have been caused by turbidity currents but must have been caused by the earthquake itself because, among other evidences, one cable broke simultaneously in two different places.

Even if we should accept the faint possibility of a turbidity current flowing from the African coast and dumping its load of fresh-water diatoms at a distance of 930 km from this coast, it remains to be explained how it was possible for this current not only to carry its load such a distance but, at the same time, to climb uphill more than 1000 m before dumping the load on top of a submarine hill. Core No. 234, with its fresh-water diatom maximum, was taken at a depth of 3577 m, and depths between the coring point and the African coast were measured to 4586 and 4967 m.

I think that Malaise's theory (*1*) explains the phenomenon in a far more plausible way than the hypothesis of Rigby and Burckle.

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22 May 1958

Effect of Calcium on Deposition of Strontium-90 and Calcium-45 in Rats

As the principal hazardous constituent of the radioactive fallout from atomic bomb tests, strontium-90 has been the object of much recent study with respect to its progression along the food chain from soil to plant to animal, and eventually to man. In nearly all of these studies, attention has been directed to the comparative behavior of strontium and calcium, the rationale being that strontium and calcium, because of their close chemical similarity, will behave similarly in biological processes. If one can determine the extent to which strontium and calcium differ in their behavior at each step in the food chain, the Sr^{90}/Ca ratio of the material at the end of the chain can be readily deduced from the Sr^{90}/Ca ratio at the beginning of the chain. Since the calcium concentration in human bone is physiologically controlled within rather narrow limits, the Sr^{90}/Ca ratio will be a measure of the actual Sr^{90} concentration, and thus a measure of the potential hazard.

This approach to the problem is exemplified by the work of Comar and associates, who have studied the comparative behavior of calcium and strontium in rats, cattle, and man, for all of the steps in the progression of these elements from plant material to human bone (*1*). By applying such data to the over-all Sr^{90} hazard problem, it has been estimated that the Sr^{90}/Ca ratio will be reduced from 6- to 12-fold in the passage from contaminated vegetation to human bone (*2*).

In applying this procedure to the evaluation of the Sr^{90} hazard, the question arises whether the discrimination between strontium and calcium at any step in the food chain may be properly considered as a constant, or whether this discrimination may actually vary considerably, depending upon environmental and physiological factors. The experiment described in this report was designed to study the effects of dietary calcium level and the duration of the feeding period on the ratio of Sr^{90}/Ca^{45} deposited in the bone of rats.

Three groups of 16 mature female rats were maintained for 30 days on diets containing 0.5 percent phosphorus, and 0.1, 0.5, or 2.0 percent calcium (*3*). After this 30-day conditioning period, Sr^{90}, Ca^{45}, and insoluble Cr_2O_3 labeled with Cr^{51} were added to the diets. Four animals from each group were sacrificed after 3, 6, 13, or 24 days on the labeled diet. One femur and a blood sample were assayed for Ca^{45} and Sr^{90}. Total calcium and phosphorus were determined in the second femur. Food consumption (Sr^{90} and Ca^{45} intake) was estimated from measurements of Cr^{51} in the total feces and contents of the gastrointestinal tract from the animals in each experimental group.

Food consumption was essentially the same on all three diets, and weight changes during the course of the experiment were negligible. Results of total calcium and phosphorus analyses indicated no significant effects of the dietary regimens on gross bone composition.

The Sr^{90} and Ca^{45} concentrations in the femur, expressed as percentages of daily intake per gram of bone ash, and the ratios of these percentage concentrations, are shown in Table 1. Within each dietary group there was an evident trend toward lower values for the Sr^{90}/Ca^{45} ratio as time on the labeled diet increased. In view of the small number of animals involved, the significance of this trend may be questioned, particularly in the higher calcium level groups. There can be no question, however, that the Sr^{90}/Ca^{45} ratios are a function of the dietary calcium level. While the content of both Sr^{90} and Ca^{45} in bone varies inversely with dietary calcium level, the effect is quantitatively different for the two isotopes and is not simply proportional in either case. Reducing calcium five fold, from 0.5 to 0.1 percent of the diet, increased the percentage retention of Ca^{45} by a factor of approximately four, at all time periods, but increased Sr^{90} retention by a factor of only two to three. Increasing calcium four fold from 0.5 to 2.0 percent of the diet decreased

Table 1. Effect of dietary calcium level on Sr^{90} and Ca^{45} concentrations in bone.

Ca content of diet (%)	Time on labeled diet (day)	Percentage daily intake per gram bone ash*			Milligrams of dietary calcium deposited and retained per gram of bone ash*
		Sr^{90}	Ca^{45}	Sr^{90}/Ca^{45}	
0.1	3	2.6 ± 0.6	13 ± 2	0.20 ± 0.02	1.2 ± 0.2
0.1	6	5.8 ± 0.9	30 ± 6	0.19 ± 0.02	2.3 ± 0.5
0.1	13	9.4 ± 1.6	64 ± 9	0.15 ± 0.02	5.8 ± 0.8
0.1	24	10.9 ± 2.3	88 ± 15	0.12 ± 0.01	9.3 ± 1.6
0.5	3	1.3 ± 0.3	4.1 ± 0.9	0.32 ± 0.10	1.9 ± 0.4
0.5	6	1.9 ± 0.3	7.3 ± 0.8	0.26 ± 0.02	3.1 ± 0.4
0.5	13	3.3 ± 0.9	14.3 ± 3.5	0.23 ± 0.01	6.3 ± 1.6
0.5	24	5.0 ± 0.6	21.8 ± 3.3	0.23 ± 0.02	10.3 ± 1.5
2.0	3	1.3 ± 0.5	2.4 ± 0.8	0.55 ± 0.09	4.4 ± 1.5
2.0	6	2.1 ± 0.2	4.7 ± 0.5	0.45 ± 0.03	7.5 ± 0.7
2.0	13	2.8 ± 0.3	6.3 ± 0.8	0.44 ± 0.01	11.8 ± 1.5
2.0	24	4.6 ± 1.8	11.4 ± 4.2	0.41 ± 0.02	23.2 ± 8.5

* All values: average of four animals ± one standard deviation.

the percentage retention of Ca^{45} about twofold, while having no significant effect on Sr^{90} retention.

The last column of Table 1 shows the total calcium derived from the diet, which is deposited and retained during the course of the experiment. These figures are calculated from the measured Ca^{45} concentration in the bone and the known ratio of Ca^{45} to stable calcium in the diet. While rather close physiological control of dietary calcium utilization is evidenced at the two lower dietary levels, this control is no longer very effective at the 2-percent calcium level.

Blood levels of Sr^{90} and Ca^{45} at different times of sacrifice were reasonably constant within a given dietary group. Between dietary groups, the blood levels of Sr^{90} and Ca^{45} varied in essentially the same manner as their concentrations in the femur. In general, for a given group of animals, the ratio of Sr^{90}/Ca^{45} in the blood was not significantly different from the ratio of Sr^{90}/Ca^{45} in the bone; this suggests, as others have pointed out (*2*), that the major discrimination between dietary calcium and strontium does not occur in the specific processes of deposition on the bone. Because total calcium analyses on blood were not obtained, and in view of the limited time period studied, closer intercomparison of the blood and bone data with a view toward elucidating discrimination mechanisms would not seem to be justified.

Wasserman *et al.* have recently described an experiment in which Sr^{90} and Ca^{45} were chronically administered with diets varying in total calcium content from 0.5 to 2.0 percent (*4*). The skeletal deposition of both Sr^{90} and Ca^{45} in their experiment was inversely proportional to the calcium content of the diet. A number of differences between the experiments of Wasserman *et al.* and those which we report may have contributed to the different results obtained. Perhaps the most significant of these differences is the constant Ca/P ratio which was maintained in all diets by Wasserman *et al.* The increase in phosphate levels may have contributed very significantly in decreasing the availability for absorption of both the Sr^{90} and Ca^{45}. Changes in Sr^{90}/Ca^{45} ratios with time were not observed by Wasserman *et al.* (*4*). Although they varied the period on the experimental diets from 15 to 45 days, Sr^{90} and Ca^{45} were present in the diets for only the final 7 days of each exposure period. Effects due to differing turnover rates of Sr^{90} and Ca^{45} in bone would not, therefore, have been observed.

Should it develop that the ratio of strontium-to-calcium retention in bone does indeed vary with dietary calcium level under conditions which would normally apply in the human being, this would have an important effect on the evaluation of the Sr^{90} fallout hazard. Results from the present experiment suggest that the variation in hazard due to uneven distribution of fallout may be more closely related to actual Sr^{90} concentrations than to the much wider range of Sr^{90}/Ca ratios (*5*).

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21 April 1958

Acanthamoeba: Observations on Animal Pathogenicity

The occurrence of *Acanthamoeba* in tissue cultures of trypsinized monkey-kidney cells has been observed by Jahnes *et al.* (*1*). We have isolated, from a similar source, an amoeba tentatively classified as *Acanthamoeba* which we have found to be pathogenic for mice and monkeys.

The amoeba first was recognized in the lesions of animals dead from the inoculation of a tissue-culture fluid thought to contain an unknown virus, but which later was shown to contain only *Acanthamoeba.*

Following intracerebral and intraspinal inoculation into cortisonized monkeys, extensive choriomeningitis and destructive encephalomyelitis occurred, causing death of the monkeys in from 4 to 7 days. Intracerebral injections into mice produced destructive encephalitis, causing death in 3 to 4 days. Many amoebae were found in the lesions at the site of inoculation, but it was obvious that the amoebae had migrated through the meningeal spaces and also through the tissue spaces of the brain and spinal cord.

To date, a few experimental observations have been made by injection of the cultures of amoebae into mice by other routes. Intravenous injection of the amoebae results in perivascular granulomatous lesions about amoebae that evidently escaped from the pulmonary capillaries. Intranasal instillation in mice lightly anesthetized with ether results in a fatal infection in about 4 days. These mice exhibit ulceration of the nasal mucous membrane with direct invasion of the adjacent base of the skull and involvement of the frontal lobes of the brain. The presence of many amoebae in the lungs is associated with a severe pneumonic reaction, with extensive fibrinopurulent exudate containing polymorphs and monocytic cells. Hemorrhage is a common feature. Pulmonary veins are invaded, and there are numerous thrombi containing many amoebae. Sections of the kidney show that the amoebae are present in the glomerular capillaries.

These observations suggest a possible explanation for the presence of the amoebae in the monkey-kidney culture and indicate that further inquiry into the possible role of the *Acanthamoeba* in disease processes is desirable.

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3 February 1958