percent of that of single-electron transitions. However, the concentration of some of this contribution into lines and its interference with the contribution of ordinary photoionization make it quite conspicuous, as shown in Fig. 5. Moreover, as emphasized by Goldberg (*10*), two-electron transitions loom even larger in spectral ranges where one-electron absorption is unlikely, such as in the ultraviolet spectra of alkaline earths where photoionization experiences a minimum.

Photoabsorption by molecules in our spectral range should display the combined influence of three effects: (i) the absorption by the constituent atoms, (ii) the special properties of valence bond orbitals from which electrons can be ejected, and (iii) the geometrical arrangement of the atoms. Only the first tentative steps toward the observation and analysis of molecular photoionization spectra have been taken thus far (*11*).

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22 April 1966

Cesium-137 Body Burdens in Alaskan Eskimos during the Summer of 1965

Abstract. *Cesium-137 body burdens of Anaktuvuk Pass, Alaska, residents during the summer of 1965 were about 30 percent less than during 1964. Lower amounts of cesium-137 in the people reflected a similar decrease of this isotope in caribou flesh, which serves as the principal food of the natives.*

Cesium-137 body burdens in Eskimo residents of Anaktuvuk Pass, Alaska, were measured during the summer of 1965, in continuation of a study begun during 1962. The purpose of this note is to update periodic reports of these data (*1*).

The measurements were made with a sodium iodide (thallium-activated) crystal (53 by 76 mm) and a photomultiplier tube connected to a compact single-channel γ-ray analyzer-scaler. This instrument had been previously calibrated with the shadow-shield counter used and described in our earlier reports. Two consecutive 1-minute counts for radioactivity were usually made of each individual; variation between these counts was consistently less than 5 percent. Five measurements of two individuals obtained at 3- to 12-hour intervals over a 2-day period varied about ten percent, which is considered to be the normal accuracy of this instrument in the range of ^{137}Cs body burdens encountered in these people.

The amount of radiation in the whole body (count/min) of all available village residents was determined on 23 to 24 July and on 24 August. During this period, I conducted a special study of the biological half-time of ^{137}Cs in 28 members of four families who agreed to abstain from their normal diet of caribou meat (*2*).

A control group of 26 adults (over 21 years of age) was selected in 1963 to provide continuity of data in certain individuals who would be available when the counts were made. This group originally consisted of 12 men and 14 women; one male member of the group died in December 1964. Average ^{137}Cs body burdens in the control group generally were slightly less than the average for the entire adult population because of the higher proportion of women, whose bodies generally contain lower amounts of ^{137}Cs than those of men (*3, 4*). The reexamination of the same individuals, rather than a population sample, was considered desirable, although it makes little difference when the entire available population is examined each time.

I have arbitrarily divided the Anaktuvuk Pass Eskimo population (approximate total, 110) into three age categories on the basis of the performance of the counting equipment and the physiological phenomena: (i) Children, 3 to 14 years; (ii) minors, 15 to 20 years; and (iii) adults, over 21 years. The population (available for examination) of Anaktuvuk Pass is comprised of about 35 children over the age of 3 years, 10 minors, and 40 adults. Examination of the ^{137}Cs body burdens of these various categories of persons on regular diets during the summer of 1965 (Table 1) shows that there was essentially no difference between the July and August values for the adults and minors. However, the children's ^{137}Cs body burdens decreased during the elapsed month, probably because several subjects participated in the U.S. Government's Project Headstart, which included a school lunch program featuring processed food containing lower ^{137}Cs concentrations than their usual diets.

Cesium-137 body burdens of the Anaktuvuk Pass residents were essentially constant during July and August, being about 30 percent lower than those recorded during the same period of 1964. This decrease reflects a lower ^{137}Cs concentration in caribou flesh which forms the food base of these people (*4*). Samples of caribou flesh from representative family food caches were analyzed and the data were compared with data of previous years (Table 2). The trend of ^{137}Cs body burdens of Anaktuvuk Pass residents closely parallels that of the ^{137}Cs in caribou flesh, which was also 30 per-

Table 1. Cesium-137 body burdens (nanocuries) in various age categories of Anaktuvuk Pass, Alaska residents during July and August 1965.

Group	Age (yr)	July			August		
		No. persons	Body burden	Per kg body wt.	No. persons	Body burden	Per kg body wt.
Adults	>21	37	920 ± 49*	15.1 ± 0.8	23	920 ± 58*	15.7 ± 1.0
Minors	15–20	8	560 ± 58	9.7 ± .9	5	490 ± 42	9.5 ± 1.0
Children	3–14	36	200 ± 18	7.8 ± .4	22	170 ± 17	6.2 ± 0.3
Controls	>21	23	870 ± 88	14.7 ± .9	16	900 ± 60	16.0 ± 1.3

* Mean ± one standard error.

Table 2. Cesium-137 concentrations in caribou flesh obtained from family food caches and human body burdens at Anaktuvuk Pass, Alaska during the summers of 1962 to 1965.

Caribou flesh		Adult humans	
No. samples	^{137}Cs/kg dry wt. (nc)*	No. persons	^{137}Cs/kg body wt. (nc)
	Summer 1962		
4	43 ± 11†	38	7.3 ± 0.4
	Summer 1963		
3	60 ± 17	42	10.3 ± .5
	Summer 1964		
8	200 ± 19	41	21.0 ± 1.0
	Summer 1965		
15	140 ± 22	38	15.1 ± .8

* Standard dry weight. † Mean ± one standard error.

cent lower than the 1964 value. The maximum value during the summer of 1965 was found in the same man who usually had had the highest burden. On 24 July his body contained 1710 nc ^{137}Cs, on 24 August 1740 nc, and on 1 September 1740 nc. These values were 30 percent less than during the summer of 1964.

The occurrence of maximum ^{137}Cs body burdens in these Eskimos during the summer months was due to the custom of stockpiling caribou during the animal's northward migration through the Anaktuvuk Pass region in the spring (May), and again during the southward migration in the fall (October). Because of the caribou's winter diet of lichens, the flesh of caribou killed in the spring contains three to six times more ^{137}Cs than that of caribou killed in the fall. The seasonal cycle of ^{137}Cs in Alaskan arctic ecosystems was discussed in earlier reports (*5*).

The values obtained in the summer of 1965 are consistent with the gradual increase of ^{137}Cs in lichens, caribou, and people at Anaktuvuk Pass since the study was begun in 1962. The unexpectedly high values in caribou flesh, and consequently in the people who ate it during the summer of 1964, were inconsistent with this pattern and were probably the result of an unusual wintering and migration pattern in caribou during the 1963 to 1964 winter months. At that time, the animals wintered farther south of Anaktuvuk Pass than usual, and the spring kill by the Eskimos evidently included animals that had acquired greater ^{137}Cs concentrations in flesh than usually associated with Anaktuvuk Pass caribou during this period.

Standards applicable to the radiation exposure of these people have recently been issued by the Federal Radiation Council and discussed before the Joint Committee on Atomic Energy of the U.S. Congress. The Federal Radiation Council Radiation Protection Guide recommended for this group of people corresponds to an annual average body burden of 3000 nc of ^{137}Cs in individual adults (*6*). It is the general consensus that current amounts of fallout radionuclides in the diet and bodies of northern Alaskan natives do not constitute a radiological health hazard (*7*).

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8. I thank the people of Anaktuvuk Pass, Alaska, for cooperation and hospitality, and Dr. Max C. Brewer, director of the Arctic Research Laboratory, for support and use of field facilities. This work was performed under U.S. AEC contract AT(45-1)-1830.

19 May 1966

Synthetic Detergents: Their Influence upon Iron-Binding Complexes of Natural Waters

Abstract. *Organic compounds extracted from Michigan lakes and streams and added to algal cultures increase the growth rate of the green alga* (Chlamydomonas reinhardi) *when iron is present. Two-dimensional paper chromatography has shown that the iron is complexed by organic fractions containing an amine group. When isolated from natural waters containing a concentration of over 0.3 part per million alkyl benzene sulfonate, these compounds do not show an iron-binding capacity. Separation of this sulfonate from the amine complexes restores the iron-binding capability. These findings suggest that detergents may influence the mobility of iron by reducing the number of binding sites, and in this way may have an important secondary effect upon the primary production of lakes and streams.*

The binding of iron by organic compounds has been shown to have an important influence upon cycling of iron in lake ecosystems (*1*) and secondarily upon the utilization of iron in photosynthesis (*2*). Amines isolated from lake waters increase the growth rate of algae (*3*) by forming iron complexes (*2*). We now report upon the influence of synthetic detergents on the iron-binding capability of naturally occurring amines and amino acids.

A large series of samples of naturally occurring organic compounds was collected from Michigan lakes and streams during the past 3 years by filtering 3000 to 3800 liters of water through a portable underwater filtering system using activated coconut charcoal (6–14 mesh) as an absorbent. We eluted organic compounds from the charcoal with a modified Soxhlet apparatus and by employing the solubility differentials of petroleum ether, methanol, and chloroform. Solvents were concentrated by rotary vacuum evaporation and a Kuderna-Danish evaporative concentrator. We combined the residues and extracted with ether. We extracted the ether solution with dilute HCl (5 percent) and made the HCl extract strongly basic with NaOH. This basic solution was then extracted with ether to remove amines. We removed water-soluble amino acids from the basic solution by acidifying with HCl to a *p*H of 1.5 and extracting with *n*-butanol.