Table 1. Experimental results. The sample numbers indicate the depth range in feet over which the sample was collected. The numbers in column 4 were calculated from the ionium and uranium contents of the samples, taking the values 8.0×10^4 years and 4.49×10^9 years as the half-lives of ionium and uranium, respectively. The uncertainties indicated are the expected standard deviations, based on the number of counts taken and on the estimate that the standard deviation in the uranium determination is ± 5 percent.

Sample No.	Uranium (ppm)	Ionium (10^{-5} ppm)	$\frac{N_{Io}\lambda_{Io}}{N_{U_I}\lambda_{U_I}}$
Y*† (surface)	0.83	< 0.1	< 0.07
		< 0.1	< 0.07
F_1 20–45	3.24, 3.14, 2.95	< 0.2	< 0.04
	2.93, 3.00		
F_1 45–55	3.73, 3.74	« 0.2	« 0.03
	3.64, 3.56		
F_1 55–60	4.68, 4.91	« 0.1	« 0.01
		« 0.1	« 0.01
F_1 60–70	5.22, 4.91	1.36 (± 0.05)	0.16 (± 0.01)
		1.48 (± 0.09)	0.17 (± 0.01)
F_1 70–80†	5.52, 5.18, 5.35	2.5 (± 0.2)	0.27 (± 0.03)
F_1 80–90	4.41, 4.59	3.8 (± 0.1)	0.49 (± 0.03)
F_1 90–100	4.07, 4.20	3.5 (± 0.2)	0.49 (± 0.04)
F_1 100–110	3.53, 3.64	4.3 (± 0.2)	0.70 (± 0.05)
		4.3 (± 0.2)	0.70 (± 0.05)
F_1 110–120†	4.08	2.6 (± 0.1)	0.37 (± 0.03)
		2.7 (± 0.1)	0.38 (± 0.03)
		2.8 (± 0.1)	0.40 (± 0.03)
F_1 120–130†	4.10	3.1 (± 0.2)	0.44 (± 0.04)
F_1 130–140†	4.04, 4.04	2.9 (± 0.1)	0.42 (± 0.03)
F_1 140–150	3.72	2.7 (± 0.1)	0.42 (± 0.03)
		2.6 (± 0.1)	0.41 (± 0.03)
F_1 150–160†	3.12	3.4 (± 0.2)	0.63 (± 0.05)
		3.5 (± 0.2)	0.65 (± 0.05)
F_1 160–170†	4.00	4.38 (± 0.05)	0.64 (± 0.03)
		4.29 (± 0.05)	0.62 (± 0.03)
F_1 170–180	3.08	3.7 (± 0.1)	0.70 (± 0.04)
F_1 180–190	2.90	4.3 (± 0.2)	0.86 (± 0.06)
		4.0 (± 0.2)	0.80 (± 0.06)
		4.4 (± 0.1)	0.88 (± 0.06)
		4.4 (± 0.1)	0.88 (± 0.06)

* Sample Y was a 360-g cluster of coral collected near the surface on Yurochi Island (Bikini). The entire piece was dissolved. Aliquots of the solution were analyzed.
† Samples in which ionium and uranium were determined by analysis of aliquots of the same solution. In other samples, separate portions of ground and well-mixed solid sample were used for ionium and uranium analysis.

sample by thenoyltrifluoroacetone extraction and ion-exchange techniques, followed by pulse analysis of the alpha activity in the separated thorium (*2, 3*).

The ionium content of the coral was found to vary with the depth in a fairly simple manner. Near the surface, the coral contains less than 2×10^{-6} ppm of ionium. With increasing depth, the ionium content first increases, reaches a value of 4×10^{-5} ppm at 100 feet, decreases sharply to about 2×10^{-5} ppm, then increases again, reaching a value of 4×10^{-5} ppm at 160 feet (Table 1).

The uranium content of the Elugelab coral also varies somewhat, but within much narrower limits—2.9 to 5.5 ppm.

On examination of the data obtained in the analysis of 16 samples over the depth range of 20 to 190 feet, it becomes apparent that coral near the surface contains far less than the equilibrium quantity of ionium. In a sample collected at 60 to 70 feet, for example, one calculates —on the basis of the uranium content— 8.7×10^{-5} ppm of ionium for secular equilibrium. The ionium found, 1.4×10^{-5} ppm, is only 16 percent of the equilibrium quantity. In a sample still nearer the surface, 20 to 45 feet, there is less than 4 percent of the amount of ionium required for equilibrium. At a depth of 100 to 110 feet, however, the coral contains approximately 70 percent of the equilibrium quantity of ionium calculated on the basis of the known uranium content.

The data obtained thus far suggest that, in the absence of leaching or other processes which would lead to differential movement of uranium and ionium in the coral deposit, the magnitude of the ionium-uranium ratio in a particular specimen may indicate the age of the specimen. This statement is based on the assumption that newly formed corals contain uranium but are essentially free of ionium.

In addition to the samples reported here, ten cutting samples from the Parry Island drilling (*1*) have been analyzed. It is interesting to note that among the coral samples analyzed to date none has been found which contains ionium in excess of the amount required for secular equilibrium with the uranium present. If separation of uranium from ionium occurs in the coral, one may expect to encounter such samples.

Core samples taken over the entire depth range in the Eniwetok drillings, live corals, and other calcareous marine deposits are now being analyzed.

J. W. Barnes
E. J. Lang
H. A. Potratz*
Los Alamos Scientific Laboratory, Los Alamos, New Mexico

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* Academic address: Department of Chemistry, Washington University, St. Louis, Mo.

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Flotational Lipoproteins Extracted from Human Atherosclerotic Aortas

In view of the interest in the relation between the lipoproteins in serum and atherosclerotic activity (*1, 2*), an examination of human aortas for the presence of similar lipoprotein fractions seemed mandatory. Experiments with rabbits that were force-fed cholesterol have shown a remarkable correlation between atherosclerotic lesions and the S_f 10-30 class of lipoproteins in the serum (*1*). In human serum any relationships are complicated by diverse, normal classes of lipoproteins, so that interpretation becomes highly statistical (*3*). Also, plaques cannot be evaluated because of the obvious inaccessibility of the tissues.

Accordingly, we have endeavored to extract fractions from aortas of fresh human necropsies similar to those observed in serum and to assess them quantitatively by ultracentrifugal flotation (*4*). These findings are compared with the degree of atherosclerosis of each extracted aorta and with the cause of death where it was classified as cardiovascular or noncardiovascular.

Aortas from both sexes were obtained from a 500-bed general hospital. Autopsies were performed 1 to 8 hours after death. Three inches of thoracic aorta just above the diaphragm were taken. They were placed in 0.9-percent NaCl and maintained at 4°C for less than 1 week.

The cause of death was determined

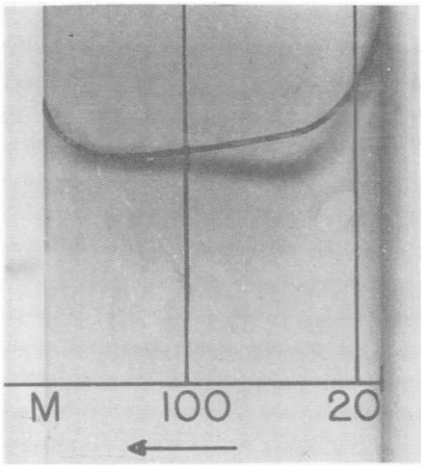

Fig. 1. Flotational optical pattern of pooled extracts from aortas showing predominance of S_f 20–100; S_f 20, S_f 100, and baseline for the cell were drawn in 2 minutes after a speed of 52,640 rev/min was attained. The area delineated by these boundaries is proportional to the concentration. Arrow indicates direction of flotation; *M* is the meniscus.

by the pathologist. The cardiovascular deaths included myocardial infarctions, cardiac failures, and one aortic aneurysm. The other deaths were noncardiovascular.

The intima was peeled from the media. The calcium deposit, if present, was delivered from the plaque and discarded to prevent dilution of the tissue. Held before a lamp, the opaque plaque was dissected from the unaffected transparent intima, which was discarded. When the specimen contained only linear streaks of fatty deposits or was devoid of lesions, that area of the intima was diced.

Classification of the intimas by degree of atherosclerosis was based on their opacity before the lamp. Degree I represents no apparent atherosclerosis or streaking, and degree II represents the presence of plaques in varying amounts. One-half-gram to 4.0-g samples were blotted and weighed. They were extracted with NaCl $\rho = 1.065$ (20/20) after maceration in a glass tissue grinder. Two 7.0-ml extractions at 4°C for 24 hours each removed all the extractable substances. They were clarified by low-speed centrifugation, were adjusted to 9-ml volume and $\rho = 1.065$ (20/20) with NaCl, and were treated thereafter exactly as in the flotational preparation and analysis of the lipoproteins of low density from serum (*5, 6*). The results were combined, and the concentrations were calculated as milligrams per 100 g of wet tissue. A flotational pattern of a pool of 20 degree-II preparations is shown in Fig. 1. A sample of the S_f 12–100 fraction from pooled serums was prepared in a separation cell (*6*) for comparison with the degree-II pool.

Table 1 describes the skewed distributions of several groupings of the 41 aortas. They are expressed as their 67th percentiles with the distribution's total range. The P_{67} is defined as that value below which 67 percent of the values in a distribution fall. The 41 aortas may be divided into one group graded as degree I (no plaques) and another graded as degree II (plaques). The degree-I preparations were found to contain no flotational materials at P_{67} and negligible amounts above this point. In contrast, the degree-II preparations contained substantial amounts at P_{67} and above for the S_f 12–100 fractions. The 41 aortas also may be divided into two groups illustrating a strong association of S_f 12–100 and plaques with cardiovascular death and a weak association with noncardiovascular death.

Our observations indicate an almost perfect correlation among plaques, cardiovascular death, and the presence of the S_f 12–100 fractions in aortas. Then the question of the identity, or at least the similarity, of the S_f 12–100 fractions from aortas and serums becomes pertinent. Because of the continuous flotational heterogeneity from S_f 12 to 100 of the fractions from both sources, and because of the small amounts of the aorta preparations available, exact identification is impossible. Nevertheless, several similarities are readily apparent. Both fractions are soluble in, and are prepared in, the same solvent under identical conditions (*5*). Both migrate with the same characteristics in a centrifugal field at comparable concentrations. At a concentration of 0.03 percent, both fractions give a negative biuret test for protein and a positive test for lipid in the presence of osmium tetraoxide (OsO_4) vapor. If it is assumed that the two fractions are closely similar heterogeneous mixtures, several conclusions may be drawn.

The most prominent lipoprotein fraction occurring in serum S_f 0–12, is absent almost completely in the aorta extracts, regardless of the presence or absence of plaques. This fact implies that this fraction is unassociated with atherosclerotic activity and is merely a normal component of serum.

The S_f 12–100 is always present in substantial amounts in aortas where there is atherosclerotic activity. It is usually present in serums in widely varying concentrations. Therefore, its presence in serums may be a reflection of this activity along with other factors.

When S_f 12–100 from aortas is analyzed as S_f 12–20 and 20–100, the latter subfraction contains most of the lipoprotein.

The absence of S_f 0–12 in all of the aortas implies that this fraction neither is forced from the serum into the intima (*7*), nor does it arise in the intima ordinarily to be released into the serum.

The association of cardiovascular death with the S_f 12–100 fraction from aortas and with the presence of plaques is very strong. It appears in ten of the 11 such deaths, no plaques having been observed in the eleventh case.

Among the noncardiovascular deaths, association between plaques and substantial concentrations of the S_f 12–100 fraction is perfect in 19 instances attributing much significance to this fraction. Its absence in the remaining 11 noncardiovascular deaths, where no plaques were observed, supports this contention.

MARTIN HANIG
JOHN R. SHAINOFF
ALEXANDER D. LOWY, JR.*
Department of Biophysics, University of Pittsburgh, Pittsburgh, Pennsylvania

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Table 1. Degree of atherosclerosis and concentrations of lipoprotein fractions extracted from human aortas (67th percentiles* in milligrams per 100 gm wet tissue).

Degree	*N*	Avg. age†	S_f 0–12	Total range	S_f 12–20	Total range	S_f 20–100	Total range
				All aortas				
I	12	49.0‡	0	0–5	0	0–14	0	0–30
II	29	66.8	0	0–40	26	0–140	110	32–570
				Aortas from cardiovascular deaths				
I	1	58.0	0	0–0	0	0–0	0	0–0
II	10	60.2§	0	0–40	20	0–40	105	35–135
				Aortas from noncardiovascular deaths				
I	11	48.1‡	0	0–5	0	0–14	0	0–30
II	19	69.9	0	0–0	27	0–140	125	32–570

* P_{67} is that value below which 67 percent of the values in a distribution fall. † Age range, 28–90. ‡ Three-day-old baby not averaged. § Age unknown for one.

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* Present address: School of Medicine, University of Pittsburgh.

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Consistent Set of Running Times

In earlier papers (*1, 2*) it has been shown that a logarithmic relationship exists between various types of racing events. It was pointed out that a consequence of the linear log-log relationship between distance and time was a linear correspondence between the log of the average rate for a given distance and the log of the distance. This phenomenon applies not only to running events but to all types of racing—for example, walking, swimming, bicycle racing, and horse racing. The slope of the latter plot was defined as an "exhaustion constant" since it is a measure of how the average rates decrease with distance. The present communication shows how the log rate-log distance plot can be used to derive a consistent set of running times based on the best efforts to date.

When $\bar{r}$ (the average rate for a given distance) is plotted against the distance d, as has been done previously (*1, 2*), it is very difficult to decide which records are actually "best efforts," for the exact shape of the curve through the points has not been determined. However, this difficulty is removed when log $\bar{r}$ is plotted against log d. Since this plot must be linear (*2*) it is easy to determine which records are not consistent with the "best efforts," for all "best efforts" must fall in a straight line, and all other records below. To determine the times in which all records below the line should be performed to put them on the line it is necesary merely to divide the distance by the rate on the line.

In order to prepare a table of consistent times for running events, a plot of log $\bar{r}$ versus log d was made for all the world records. The plot was divided into two parts for convenience, one plot for the records for distances up to 1 mile and another for the records from 1 mile to the 2-hour run.

Table 1 presents a set of times for running events that has been derived from the linear log $\bar{r}$ versus log d plots. The 100-yard and 100-meter events have not been considered because of the strong effect of the start on these events which causes a considerable deviation from the straight-line function. It is obvious that the 220-yard, 1-mile, and 1-hour records are all equivalent performances and "best efforts," and that all other records need improvement to make them consistent. The amount of improvement necessary (Δt) is indicated in column 4 of Table 1. The last column of Table 1 shows the amounts (Δt) by which the present Olympic records can be bettered to bring them into line with the best efforts to date.

Table 1. Consistent times for running events.

Distance	Time (hr: min: sec)	Consistent time (hr: min: sec)	Δt (sec)	Δt for present Olympic records (sec)
220 yd	0:0:20.1	0:0:20.1	0	
440 yd	0:0:46.0	0:0:45.8	0.2	
880 yd	0:1:48.6	0:1:44.5	4.1	
1 mi	0:3:58.0	0:3:58.0	0	
2 mi	0:8:40.4	0:8:22.1	18.3	
3 mi	0:13:14.2	0:12:57.6	16.6	
6 mi	0:27:59.2	0:27:19.8	39.4	
10 mi	0:48:12.0	0:47:23.3	48.7	
15 mi	1:16:26.4	1:13:22.4	184.0	
200 m	0:0:20.2	0:0:20.0	0.2	0.7
400 m	0:0:45.8	0:0:45.5	0.3	0.4
800 m	0:1:46.6	0:1:43.7	2.9	5.5
1,000 m	0:2:19.5	0:2:15.3	4.2	
1,500 m	0:3:41.8	0:3:39.1	2.7	6.1
2,000 m	0:5:07.0	0:5:01.0	6.0	
3,000 m	0:7:58.8	0:7:45.8	13.0	
5,000 m	0:13:40.6	0:13:27.3	13.3	38.7
10,000 m	0:28:54.2	0:28:24.3	29.9	52.7
15,000 m	0:44:54.6	0:43:43.2	71.4	
20,000 m	0:59:51.7	0:59:51.5	0.2	
25,000 m	1:16:34.6	1:16:11.9	22.7	
30,000 m	1:35:23.8	1:32:40.7	163.1	
12 mi, 809 yd	1 hr	1 hr	12 mi, 809 yd*	
22 mi, 418 yd	2 hr	2 hr	23 mi, 1373 yd*	

* Consistent distance.

It should be strongly emphasized that the rates which fall on the straight-line plots are in no sense "ultimates." The rates will be increased by better training methods, better nutrition, and improved tracks and equipment. However, the underlying logarithmic relationships will be maintained so that at any time it will be possible to show which records are out of line when compared with the best efforts.

M. H. Lietzke
Oak Ridge National Laboratory, Oak Ridge, Tennessee

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Comparison of Pinch-Caliper and X-ray Measurements of Skin plus Subcutaneous Fat

Although numerous studies of subcutaneous fat have appeared, only one previous report has dealt with the relationship between its roentgenogrammetric measurement and its measurement by spring-loaded pinch calipers in males (*1*).

In the present study (*2*) the thickness of the fat-plus-skin layer, at the level of the lowest rib at the midaxillary line, was measured by both techniques. Pinch-calipers exerting a force of 300 g over a 30 mm² area (*3*) were used to measure a double "fatfold," while measurements of the single-thickness shadow were made on standardized teleoroentgenograms (*4*).

Agreement between the two methods was high ($r = 0.88$) for 65 young men aged 21 to 22 years, thus confirming Baker's findings for thigh and arm fat (*1*). The median pinch-caliper value was 12.0 mm, while the median roentgenogrammetric measurement was 9.3 mm. On this basis, the actual pinch-caliper values were 65 percent of the true double-fold thickness (18.6 mm).

The possibility that the skinfolds were reduced 35 percent throughout the entire range was tested by comparing the distribution of pinch-caliper values to the roentgenogrammetrically determined values multiplied by 1.3. Using the Kolmogorov-Smirnov test (*5*), the two distributions were not significantly different at the 5-percent level (Fig. 1).

The two methods of measuring skin