base of Guyot 20171. His faunal list and figured specimens leave no doubt concerning the validity of his results. His data suggest that the guyot was near sea level in the early Tertiary and Cretaceous. It is interesting to note that Arrhenius reports that core 57 was collected from a seamount (*6*, p. 154), and this may have been much shallower in the Tertiary than it is now. Until a faunal analysis is made of the cores in question, it would seem questionable to accept the isotope data of Emiliani as demonstrating paleotemperatures of abyssal waters.

ORVILLE L. BANDY
Department of Geology, University of Southern California, Los Angeles

References and Notes

1. C. Emiliani, *Science* 119, 853 (1954).
2. J. A. Cushman, R. Todd, R. J. Post, *U.S. Geol. Survey Profess. Paper 260-H* (1954).
3. Oral communication from R. B. Hutcheson, Superior Oil Co., Bakersfield, Calif.
4. J. A. Cushman and R. M. Stainforth, *Cushman Lab. Foraminiferal Research Spec. Publ. 14* (1945), p. 7.
5. J. A. Cushman and R. Todd, *Cushman Lab. Foraminiferal Research Contrib. 18* (1942), p. 19.
6. G. Arrhenius, *Repts. Swedish Deep-Sea Expedition 1947–48* 5, fasc. 1 (1952).
7. E. L. Hamilton, *J. Paleontol.* 27, 207 (1953).

2 September 1955

On Paleotemperatures of Pacific Bottom Waters

A detailed faunal analysis of the samples of cores 53 and 57 was not published in my previous paper (*1*) because the micropaleontological study of these two cores was assigned by H. Pettersson to F. Brotzen, who will presumably report in the near future.

However, in view of O. L. Bandy's justified criticism of micropaleontological dating based on one or two key species only, and with Brotzen's permission, I present a schematic analysis of the two cores in question in Table 1.

The samples analyzed were core 53, 2 to 10 cm, 282 to 290 cm, and 339 to 346 cm below the top; core 57, 412 to 420 cm and 478 to 483 cm below the top. These samples are the same as those on which isotopic analyses were performed.

A Middle Oligocene age for core 53 and a lower-middle Miocene age for core 57 are clearly indicated by the table. No shallow water benthonic species have been observed.

Certain similarities between Paleogene marine invertebrate faunas of Central America and Europe, on the one hand, and Neogene ones of the Indo-Pacific, on the other hand, have been observed by several authors, including me (*2*, p. 84, Table 18). These similarities are produced by the survival in the Indo-Pacific of types that evolved faster and disappeared earlier in the western Tethys, following the isolation of this area from the Indo-Pacific in mid-Tertiary time (*3*). Thus, certain genera and species that occur exclusively during the Paleogene in Central America and Europe occur in association with Neogene faunas in the Indo-Pacific. This, however, is not the case of the short-range species of the table, including *Cassidulina spinifera*, none of which has been found, so far, in association with Neogene faunas of the Indo-Pacific. Hutcheson's unpublished opinion that *Cassidulina spinifera* is not older than Pliocene in the Pacific area needs substantiating evidence.

The occurrence of typical specimens of *Cassidulina spinifera* in association with modern faunas in bottom samples from the Marshall Islands is neither surprising nor a demonstration that this species is extant in the Pacific. These samples, including those in the collections of the Allan Hancock Foundation, come from the top and sides of a guyot (*4*) and are likely to contain reworked fossils, as Hamilton has shown for a different area (*5*) and as Bandy himself mentions. Similarly, the probable occurrence of *Laticarinina bullbrooki* at a single *Albatross* station in the Caribbean off Panama may be due to reworking. Increasing knowledge of deep-sea sedimentation is continuously reducing the areas where sedimentation is found to be continuous or undisturbed—a condition that once was thought to prevail along most of the ocean bottom. Current views on deep-sea sedimentation are discussed in recent papers by Ericson, Ewing, Heezen, and Wollin (*6*) and by Revelle, Bramlette, Arrhenius, and Goldberg (*7*), covering the Atlantic and Pacific oceans, respectively. From these important papers, it appears evident that conclusions concerning age and ecology of fossils from the deep sea must be based on selected samples from selected areas.

As far as is known at present, the eastern Pacific eupelagic area is one of the least disturbed of the ocean bottom, and its hummocky bottom topography is a safeguard against influx of material from turbidity currents and displaced faunas. Core 57 was taken from the top of a shield-shaped elevation about 180 m high (*8*)—one of the great many that apparently occur in that area. These structures may be original features of the earth's crust or, as is suggested by Arrhenius (*8*), shallow laccoliths. They are not volcanic extrusions. Therefore, it is unlikely that the ocean floor at the location of core 57 stood in Miocene time more than 4000 m higher than it does at present, as is required by Bandy's hypothesis.

In summary, cores 53 and 57 appear to be of Middle Oligocene and lower-middle Miocene age, respectively. Bottom morphology and regional submarine geology indicate that the microfossils on which the oxygen isotopic analyses were made (*1*) grew in place and at approximately the present depth. The probable conclusion is that the isotopic temperatures published previously (*1*) represent the bottom temperatures of the ocean water at the given times, localities, and depths.

CESARE EMILIANI
Enrico Fermi Institute for Nuclear Studies, University of Chicago, Chicago, Illinois

Table 1. Schematic analysis of cores 53 and 57. The Lower, Middle, and Upper divisions of the Tertiary epochs are indicated by the abbreviations L, M, and U.

Species	Upper Cretaceous	Eocene	Oligocene	Miocene	Pliocene	Pleistocene
		L M U	L M U	L M U	L M U	
Core 53						
Anomalina almendarensis		———				
Cassidulina spinifera			——			
Cassidulina subglobosa			———	———	———	
Globigerina venezuelana			——	— — —		
Gyroidina planulata				——		
Nodogenerina challengeriana				———	———	
Pleurostomella elliptica				——		
Pullenia quinqueloba			———	———	———	
Spiroplectammina grzybowskii	———	———				
Core 57						
Eggerella bradyi				———	———	
Globigerina quadripartita				——		
Globigerinoides sacculifera immatura			——	—— —	—	
Gyroidina zelandica			——	—— ——	—	
Laticarinina bullbrooki			———	——		
Pulleniatina obliquiloculata					———	———
Sphaeroidinella rutschi				——		

References

1. C. Emiliani, *Science* 119, 853 (1954).
2. ———, *Palaeontographia Italica* 48, 77 (1954).
3. A. M. Davies, *Tertiary Faunas* (London, 1934), vol. 2.

4. J. A. Cushman, R. Todd, R. J. Post, *U.S. Geol. Survey Profess. Paper 260-H* (1954).
5. E. L. Hamilton, *J. Paleontol.* 27, 207 (1953).
6. D. B. Ericson *et al.*, *Geol. Soc. Amer. Spec. Paper 62* (1955), p. 205.
7. R. Revelle *et al.*, *ibid.*, p. 221.
8. G. Arrhenius, *Repts. Swedish Deep-Sea Exped. 1947–1948* 5, fasc. 1 (1952).

17 October 1955

Hemoglobin-Reactive Substance in Human Serum

Under the title, "Demonstration of hemoglobin-reactive substance in human serum," a paper has been published by A. H. Tuttle (*1*) reporting on a phenomenon that we also had noticed when we were studying the influence of hemolysis on quantitative paper electrophoresis of human serum (*2*). We then identified this "hemoglobin-reactive substance" as haptoglobin, a well-characterized protein of the α_2-globulin group on which much work has been done, mostly by European investigators (*3*).

The observation by Tuttle that no complex formation occurs in the serum of the newborn is very interesting and substantiates our conclusion, for only traces of haptoglobin can be demonstrated in such serum. I may also add that the electrophoretic mobility of this complex is slightly inferior to that of α_2-globulin. If it is not taken into account, the phenomenon described may be a major source of error when even slightly hemolytic human serums are submitted to paper electrophoresis (*4*).

ROGER J. WIEME
Department of Internal Medicine, University of Ghent, Ghent, Belgium

References

1. A. H. Tuttle, *Science* 121, 701 (1955).
2. R. J. Wieme, *Experientia* 9, 380 (1953).
3. M. F. Jayle, *Exposés ann. biochim. med.* 3, 176 (1942).
4. R. J. Wieme, *Rev. belge pathol. et méd. exptl.* 23, 321 (1954).

13 June 1955

Reports published by M. F. Jayle *et al.* (*1*) and by R. J. Wieme (*2*) brought attention to the fact that the presence of small amounts of hemoglobin in serum being studied by electrophoresis may result in significant errors in quantitative determinations of the α_2- as well as the β-globulin fractions. Their experiments indicated that errors occurred as a result of complex formation between hemoglobin and an α_2 globulin, probably haptoglobin. Similar independent studies that were carried out in our laboratory during this time have been published (*3*); they confirm these observations.

Ordinarily, this important source of error in quantitative paper electrophoresis of serums has not been taken into account, perhaps because of the fact that the work of these European investigators is not generally known. Unfortunately, I was not aware of these reports at the time the results of my experiments were published, and accordingly, appropriate references were inadvertently omitted. It is the purpose of this communication to call attention to the experiments reported by Jayle and by Wieme.

A. H. TUTTLE
Division of Pediatrics, University of Tennessee, Memphis

References

1. M. F. Jayle *et al.*, *Bull. soc. chim. biol.* 34, 1063 (1952).
2. R. J. Wieme, *Experientia* 9, 380 (1953); *Rev. belge pathol. et méd. exptl.* 23, 321 (1954).
3. A. H. Tuttle, *Science* 120, 701 (1955).

15 December 1955

Serum Components in the Newborn

Previous investigations were concerned with the patterns of distribution of serum proteins (*1*), lipoproteins (*2*), and glycoproteins (*3*) in normal adult human beings by means of paper electrophoresis. The present study extends these observations to the newborn infant (*4*).

Umbilical cord blood samples were obtained from ten infants at birth. The serum was analyzed by paper electrophoresis, parallel paper strips being stained simultaneously for proteins (Amidoschwarz *2, 5*), lipoproteins (Oil Red O, *2, 6*), and glycoproteins (Periodic acid Schiff, *3, 7*). Chemical analyses performed included estimation of serum total protein, albumin and globulin (biuret method), total and esterified cholesterol (Sperry-Schoenheimer method *8*), protein-bound polysaccharide (*9*), and hexosamine (*10, 11*).

Quantitative differences between newborn infants and adults were observed in all categories studied (Tables 1 and 2). The serum protein pattern of newborn infants was characterized by lower values of albumin and elevation of gamma globulin. The lipoprotein profile of the newborn differed from that of the adult in relative decrease in beta-lipoprotein and increase of the O-fraction (lipid not migrating in the electric field), while the proportion of alpha-lipoprotein was unchanged. Glycoproteins in cord blood stained less intensely than they do in adult blood; there was relatively more beta-glycoprotein and less alpha-2 glycoprotein. Similarly low values for the newborn were obtained in chemical estimation of serum total and esterified cholesterol, polysaccharides, and hexosamine in cord blood. Rough correlation was observed between the total area of glycoprotein stained, measured by the planimeter, and the levels of total serum polysaccharide or hexosamine that were determined chemically. Total protein was somewhat low, but there was no alteration of the albumin-globulin ratio as determined by the usual salting-out technique.

A newborn infant of a mother with familial hypercholesteremia (xanthoma tendinosum, xanthelasma, coronary heart disease) was subjected to a similar investigation. No significant difference from the pattern of normal infants was observed in the distribution of proteins, lipoproteins, or glycoproteins. It was noted, however, that the lipid bands stained with greater intensity. The serum total cholesterol level was elevated, in

Table 1. Electrophoretic patterns of proteins, lipiproteins, and glycoproteins of newborn infants compared with those of adults. The figures give the percentage of total stainable material. Proteins stained with Amidoschwarz, lipoproteins with Oil Red O, and glycoproteins with Periodic acid Schiff.

Measurement	Proteins					Lipoproteins			Glycoproteins		
	Albumin	α-1-globulin	α-2-globulin	β-globulin	γ-globulin	α	β	O-fraction	α-1	α-2	β
Cord blood											
Mean	41.3	7.1	11.6	12.6	27.4	36.9	39.9	23.2	30.4	52.1	17.5
S.D.	5.6	2.1	2.6	4.0	4.4	6.6	5.2	9.4	4.1	3.4	4.7
Adult											
Mean	52.5	4.2	12.2	14.0	17.1	35.3	52.3	12.3	28.8	41.6	29.6
S.D.	3.7	1.5	3.6	2.9	3.0	6.7	7.2	3.8	3.8	3.6	3.1
Statistical significance of differences of mean values between newborns and adults											
p	0.0005				< 0.0001		0.0005	0.0035		< 0.0001	< 0.0001

Table 2. Chemical analysis of serum components of newborn infants compared with analysis of those of adults.

Measurement	Total protein (g%)	Albumin (g%)	Globulins (g%)	Total cholesterol (mg%)	Esterified cholesterol (mg%)	Total polysaccharides (mg%)	Hexosamine (mg%)
Cord blood							
Mean	6.2	4.1	2.1	79.4	58.6	69.3	74.6
S.D.	.7	.2	.3	15.2	10.3	9.8	11.1
Adult							
Mean				211	157	103 (*14*)	93 (*10*)
S.D.				31	25		