transformation, we obtain $(s_y^2 - s_{y.x}^2)/s_y^2 = .90$, which is a substantial improvement.
5. Modern medical treatment may reduce the severity of illness caused by the malarial parasite, but it may also prevent or reduce the severity of deleterious conditions associated with the sickle-cell trait. Where malaria is prevalent, the advantage would seem to remain with the heterozygote.

23 January 1968

Hexter states that there is an error in my analysis of the relationship between the intensity of malaria and the selective advantage of the "sickler" heterozygote, because extrapolation of the equation to low levels of malarial parasitism reveals that the "sicklers" still have a selective advantage. I appreciate Hexter's effort and interest; however, no such extrapolation was made in my article. Hexter argues from the assumption that Eq. 1 in my article may be taken at its face value; however, this assumption is not valid. I stated (*1*) that the relationship approximated by the equation was valid (i) only in east and west subsaharan Africa; (ii) only for Negro agricultural communities of many centuries' duration; and (iii) only for hyperendemic falciparum malaria. Any extrapolation of the relationship to evaluate the response of the sickle-cell trait at very low levels of malarial parasitism is unrealistic because low levels of malarial parasitism are commonly associated with vivax malaria, with different species of mosquitoes, and with different environments. Also, mild malarial parasitism is characteristically epidemic, seasonal, and therefore associated with sporozoite rates much higher than those of stable, endemic malaria (*2*). In areas where levels of parasitism are low, the deleterious factors of the sickle-cell trait play a relatively greater role in morbidity and mortality.

Within these limits of the relationship, Hexter's logarithmic transformation is a better approximation of the data than the straight-line equation. However, the differences are small.

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7 March 1968

Unmineralized Fossil Bacteria: A Retraction

I have described (*1*) unmineralized fossil bacteria from two sources, widely separated in time and space. The first occurrence was in present-day calcite crystals that grew, in part at least, in the black mud at the bottom of Green Lake, near Fayetteville, New York. The second was in a black, lacustrine limestone stratum from the Lower Cretaceous Newark Canyon Formation from an area south and east of Eureka, Nevada. When two friends to whom I had sent parts of my sample of the Newark Canyon limestone failed to find the coccoid bacteria, I reexamined the sample and made the embarrassing discovery that the minute spheres were fluorite artifacts produced during the preparation of the material for microscopic examination.

The organic matter in the black limestone of the Newark Canyon Formation had been isolated by dissolving the rock in dilute HCl. A small portion of this finely divided organic matter was wholly destroyed when treated with warm 30 percent hydrogen peroxide, which demonstrated that all the organic matter was unmineralized. Because the finely divided organic matter resisted dispersion, I supposed that aggregates of the particles may have been held together with small amounts of silica. They were therefore treated with HF and, to eliminate any remaining free acid, the treated material was taken to dryness on a steam bath. When taken up with distilled water, the organic particles dispersed satisfactorily in a sonicator and were then centrifuged to remove the coarser particles. Fractions of the very fine dark particles remaining in suspension were removed with a pipette to microscope slides; the sample was dried on the slide and mounted in glycerin. These fractions consisted largely of the minute spheres shown in Fig. 1 of my earlier report (*1*). These spheres I mistook for coccoid bacteria. Instead they were fluorite, which formed because I had failed to wash all the calcium out of the organic matter before treating it with HF. To complete my confusion, the fluorite spheres had occluded enough organic matter to color them dark brown. I was as completely taken in as Don Quixote when he blamed "The Enchanter" for changing "that giant into a windmill at the last moment" (*2*).

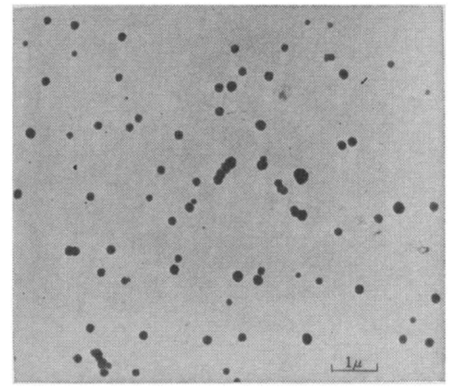

Fig. 1. Electron micrograph (shadowed with uranium) of fluorite spheres precipitated from dilute $Ca(NO_3)_2$ solution with HF in the presence of "humic" organic matter. The spheres, which have a median diameter of 0.2 μ, have a tendency to clump and to arrange themselves into short chains that stimulate certain bacteria. [E. J. Dwornik, U.S. Geological Survey]

It is easy to duplicate the minute fluorite spheres (Fig. 1) by adding HF to a dilute $Ca(NO_3)_2$ solution, provided that organic matter is present. Without organic matter, one gets only minute, ill-formed crystals of fluorite. I was not successful, however, in reproducing the dark-brown color of the fluorite despite the addition of various deeply colored "humic" leachates to the calcium nitrate solution.

Having been shaken by this experience, perhaps I should question also my interpretation of the dark-brown, nearly black, spherical particles that I found in the calcite crystals from the bottom mud of Green Lake, New York. Certainly they are not fluorite spheres. On the other hand, exhaustive efforts by Vallentyne and Brunskill (*3*) to establish viability of these particles failed. Could it be that the particles showed no spark of life because they were not whole microorganisms before being trapped in the calcite crystals?

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References and Notes

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27 February 1968