only moderately asymmetric, the effect of diffusion on r_{max} may be easier to overlook. The shift will continue at a decreasing rate throughout the run. As a result, the experimental curve of ln r_{max} plotted against time will be nonlinear. The curvature may not be obvious, however, particularly if there is any uncertainty in the location of r_{max}, as there may be with the relatively wide boundaries observed late in the run. If the best straight line is fitted to the points, an erroneous sedimentation coefficient will be obtained. Behavior of this kind is probably less common than that associated with narrow, highly asymmetric boundaries. Wide and moderately skewed initial boundaries seem to be most often encountered when the solute concentration is low and the boundary is not well stabilized against convection during the acceleration of the centrifuge rotor.

Fujita and MacCosham (*5*) have described the behavior of a sedimenting boundary in a standard ultracentrifuge cell, in which the gradient curve is distorted by restricted diffusion at the meniscus. A maximum in the gradient curve does not appear until the experiment has been under way for some time, and the boundary separating from the meniscus is skewed. As the boundary moves away from the distorting influence of the meniscus, the peak proceeds to overtake the position it would have occupied if the boundary had not been subjected to restricted diffusion. This interesting effect probably differs from the diffusion shift that has been described here only in the cause of the original skewing of the gradient curve. In both cases, the anomalous rate at which r_{max} moves down the cell is due to the tendency of diffusion to restore the symmetry of the gradient curve.

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27 December 1965

Drosophila melanogaster: Inheritance of a Deficiency of Alkaline Phosphatase in Larvae

Abstract. *A deficiency of the normally prominent alkaline phosphatase zone (by starch-gel electrophoresis) has been discovered in a newly investigated laboratory strain of* Drosophila melonogaster. *Mating experiments indicate that genetic control is by an allele of a previously described electrophoretic variation. Heterozygotes resulting from crosses of the deficient type and the fast electrophoretic variant show only the fast phenotype. In deficient × slow heterozygotes, however, there is a new band that does not correspond in electrophoretic mobility with any of the bands of other heterozygous or homozygous types. It is suggested that the allele responsible for the deficiency leads to the manufacture of an inactive subunit that is able to hybridize with the subunits of the slow electrophoretic form.*

During the later hours of larval development in *Drosophila melanogaster*, a densely staining alkaline phosphatase (APH) zone is detectable when single individuals are electrophoresed in starch gels. Previously described (*1*) are the genetic control of an electrophoretic variation in that zone and the appearance of a hybrid enzyme in heterozygotes; the observations are consistent with the hypothesis that the active enzyme is a dimer consisting of two identical subunits in homozygotes, and that combination of unlike subunits in heterozygotes produces an enzyme molecule of intermediate mobility.

Investigation of the various isozyme patterns of an inbred *car* strain of *Drosophila* revealed a complete lack of demonstrable APH activity in the area of the normally dense APH component. After the deficiency was confirmed in several consecutive generations, adult flies from the stock were mated with homozygous fast (Aph^F/Aph^F) and slow (Aph^S/Aph^S) strains, and the F_1 larval offspring were examined. The deficient × fast hybrid produces only a fast band, the intensity of which is no more than slightly less than that of Aph^F/Aph^F type (Fig. 1). Examination of deficient × slow hybrid larvae reveals two bands: one corresponding to the expected slow band; the other migrating slightly faster than the hybrid band of Aph^F/Aph^S (Figs. 1, 2).

Except for the new band in the deficient × slow heterozygotes, the phenotypes are compatible with production of the deficient phenotype by a "silent" Aph^O allele. This finding is supported by the segregation ratios resulting from backcrosses, outcrosses, and $F_1 \times F_1$ matings of deficiency heterozygotes. The mating experiments are summarized in Table 1. Preliminary support for allelism has been obtained by comparing map distances between *Aph* and the *Est 6* locus, using the deficiency as well as the electrophoretic variation.

The presence of the "extra" band in Aph^S/Aph^O heterozygotes possibly results from combination of an S subunit and the product of the "silent" allele, in which case Aph^O produces protein that cannot dimerize, or does dimerize but is inactive for some reason under the test conditions employed. No indication of a double band has yet been found in Aph^F/Aph^O larvae; all attempts show only the single band, in starch gels with continuous and discontinuous buffer systems at *p*H 9.5, 8.5, 7.5, 7.0, 6.5, 6.0, and 3.0; in poly-

Table 1. Numbers of offspring from matings of various parental phenotypes, demonstrating segregation of Aph^O. Phenotypes designated F^F are from homozygous Aph^F/Aph^F flies. The designation F^O is used for F_1 hybrids from a cross between homozygous fast and deficient strains. APH, alkaline phosphatase.

Parental APH	Phenotypes of Offspring					Offspring (No.)
	F	O	SO	FS	S	
$F^F \times O$	31					31
$S \times O$			29			29
$F^O \times O$	74	52				126
$F^O \times F^F$	84					84
$SO \times O$		97	69			166
$SO \times S$			83		87	170
$SO \times F^F$	24			21		45
$F^O \times S$			70	67		137
$F^O \times F^O$	84	29				113
$SO \times SO$		27	60		20	107

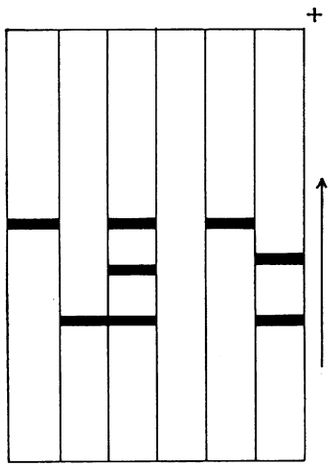

Fig. 1. Diagrammatic comparison of larval APH phenotypes in phosphate buffer, 0.01*M*, *p*H 6.5. The genotype is indicated below each pattern by the superscript of the appropriate *Aph* alleles.

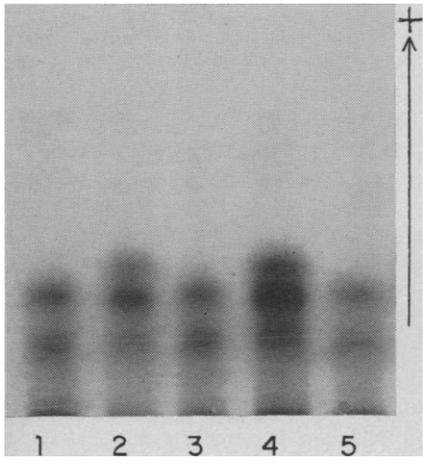

Fig. 2. Photograph of starch gel showing alternate SO (*1*, *3*, and *5*) and FS (*2* and *4*) phenotypes.

acrylamide slabs at *p*H 8.5 and 7.0; and in disc electrophoresis (*2*) at *p*H 9.5 and 6.6. This finding can be interpreted as indicating a structural difference between fast and slow APH, which prevents the fast and the silent protein subunits from combining into active enzyme.

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Dehydration and Rehydration in a Prebiological System

Abstract. *A proteinoid microsphere suspension system was subjected to cyclic dehydration and rehydration. Particles having somewhat coacervate properties were observed, suggesting a relation between the coacervate and proteinoid origin of cells.*

In an attempt to see how simple environmental changes could affect a prebiological system, we subjected the proteinoid microsphere suspension of Fox (*1*) to periods of alternate dehydration and rehydration. Hinton and Blum (*2*) speculated that such treatment could be a factor in molecular evolution, suggesting "that the chemical complexity required for the origin of the organisms was achieved by a series of reactions that occurred in the alternately wet and dry niches so numerous on the land." Their reasons for this statement were that in small niches, there would be a relatively high concentration of macromolecular substances compared to that in the free sea and also high pressures generated by surface tension forces. These conditions could lead to the formation of complex systems.

Our prebiological system was prepared by the thermal copolymerization of the 18 amino acids common to protein. The resulting protein-like polymer has been named proteinoid by Fox and Harada (*3*) who have also described its chemical properties. A hot aqueous solution of the purified polymer (15 mg/2.5 ml) was cooled, with resultant production of microspheres (*1*), which were approximately 2 μ in diameter (Fig. 1). Drying and rehydration experiments were then carried out with this suspension.

A drop of the suspension was placed on a microscope slide and allowed to air dry at room temperature. This treatment yielded a hard transparent matrix in which the microspheres were embedded. The stability of the microspheres under dehydration has been reported by Young (*4*).

We then rehydrated the preparation with one or two drops of McIlvaine's buffer (citric acid–sodium phosphate), *p*H 8.0, placed on the edge of the dried matrix. The buffer streamed into the matrix forming a rehydration front. As the front advanced, the matrix and microspheres were quickly dissolved, and after about 5 minutes, larger spheres, 10 to 30 μ in diameter (Fig. 2) appeared. Unlike the original microspheres, they showed a great deal of coalescence and plasticity, as evidenced by changes in shape. As these large spheres moved off into the rehydration medium, they would swell and eventually disappear presumably due to dissolution. As the rehydrating front slowed down, the spheres no longer coalesced and showed increased stability. If at this time water was added, the coalescence phenomena

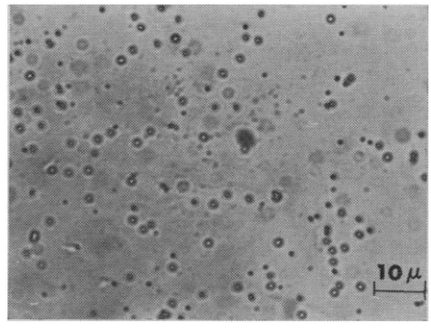

Fig. 1. Microspheres prepared by cooling hot aqueous solution of proteinoid polymer.

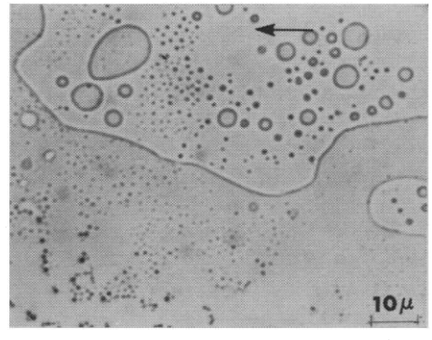

Fig. 2. Formation of new spherical bodies at rehydration front. Arrow indicates rehydration direction. The newly formed bodies become spherical very rapidly. In this first rehydration, little complexity is observed.

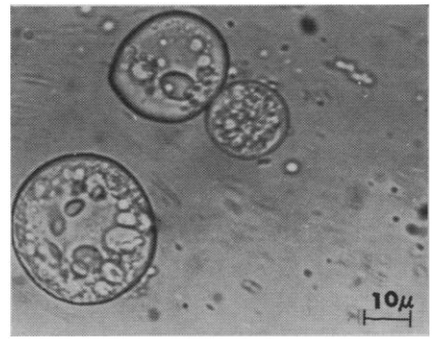

Fig. 3. Coacervate-like spheres showing complex morphology.