

(4) Flood sections with picro-anilin blue and leave two hours.

(5) Draw off excess stain and wash sections for ten seconds in absolute alcohol.

(6) Transfer sections to clove oil and mount in Canada balsam.

The above method of differential staining is one of substitution, whereby the alcoholic solution of picro-anilin blue is made to wash out the safranin from all but so-called structures, for which the latter stain has a great affinity.

Criticism might be aimed at the short period of time for step five above in dehydrating, but results secured seem to justify the means used, a longer period causing excessive loss of color.

Using white oak wood as an example, the middle lamella is stained red, crystal forms a bright blue, and cell walls from light-yellow to blue or greenish-blue. Furthermore, in oak, many wood fibers whose lumen was constricted to a wavy line or "lazy S" in shape were found to have the entire thickened inner or tertiary wall stained a bright blue, while the secondary layer (in these fibers comparatively narrow) was stained yellow or olive green like the entire wall exclusive of the middle lamella of some other fibers.

An identification of these fibers with blue inner walls links them closely with mucilaginous cells. According to Jeffrey,¹ the presence of these cells reduces the swelling and shrinking of wood.

In addition to the differentiation obtained, this combination of stains has the advantage that the general yellow-green or apple-green hue of the sections is not tiring to the eye.

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SPECIAL ARTICLES

THE COINCIDENT PRODUCTION OF DEXTRAL AND SINISTRAL YOUNG IN THE LAND-GASTEROPOD PARTULA

AMONG the many problems of gasteropod asymmetry, none is more interesting than that which is concerned with the nature of the factors by which the direction of the coil is controlled. According to general experience, the prevailing mode is the dextral or clockwise from foot to apex when viewed from in front; the opposite sinistral form of coil is displayed by occasional examples of some dextral species. Again, certain species are uniformly sinistral, while others are sinistral in the main with sporadic dextral

individuals. It is justifiable to denote the direction of the coil, a hereditary quality, on the same grounds that any other resemblances between offspring and parents are called hereditary, even though the parental characters are not always repeated faithfully in the progeny.

Boycott and Diver¹ have recently recorded the results of their studies upon *Limnaea* in which they have employed the usual dextral and the unusual sinistral kinds of snails. They regard their findings as evidence that dextrality is a Mendelian dominant with reference to the reversed mode of coil. Sturtevant² discusses the results of Boycott and Diver, and ingeniously interprets them in terms of maternal inheritance under earlier chromosomal control. Morgan³ reviews the phenomena of spiral cleavage in relation to the dextral and sinistral modes of coil, and accepts Sturtevant's interpretation.

Mayor⁴ and the present writer⁵ have studied the *Partulae* living in Tahiti, where certain colonies of species, such as *Partula otaheitana*, comprise both dextral and sinistral snails. We found no exceptions to the rule that the young produced at any one time by a given adult were *all* of the *same* mode of coil, whether or not this agreed with the parental form of asymmetry. An adult of either type might bear young of its own mode exclusively or a series of offspring which all displayed the opposite direction of twist. Boycott and Diver observed the same relations in most of the offspring broods of *Limnaea*, but mixed broods also occurred in their material.

Exceptional instances have now been found in a species of *Partula* where dextral and sinistral young occurred simultaneously in the parental brood-pouch. The species in question is *Partula suturalis*, which dwells in the island of Moorea, a member of the Society Islands, situated about 20 miles from Tahiti. This species now ranges over almost all Moorea, and some of its colonies are made up of both dextral and sinistral snails. When the embryonic young were extracted from the parent animals taken in the valley of Faamaariri in the Vaiare region, five cases were found where two young were present in the brood-pouch, one of which was sinistral, while the other was dextral. In four of these instances the parent was dextral and in the fifth case the adult was sinistral.

It is particularly interesting that the exceptions herein recorded were found in *only one* association of mixed character. In this Faamaariri series, the noteworthy instances number five out of 148 where two or more young were present in the brood chamber; the

¹ Proc. Roy. Soc., 95 B, 1923.

² SCIENCE, LVIII, No. 1501, 1923.

³ Scientific Monthly, XVIII, No. 3, 1924.

⁴ Mem. Mus. Comp. Zool., XXVI, No. 2, 1902.

⁵ Carnegie Inst. Pub. No. 228, 1917.

¹ Jeffrey, E. C. "The Anatomy of Woody Plants," p. 35.

rest conformed to the general rule. If the data relating to all the mixed colonies of *Partula suturalis* are assembled, the summary is as follows: Cases where two or more young are *like* the parent, 1,133; cases where two or more young are *unlike* the parent, 184. There are, therefore, 1,317 instances in the *suturalis* material in which the rule is observed. If the facts are brought together for all the colonies of Tahitian and Moorean species in which dextral and sinistral snails occur, the number of conformable instances amounts to more than 3,000. In sharp contrast with all these, there are only five observed cases of mixed broods in *Partula*, and these have been found in only one species, in a single locality.

Sturtevant's proposed explanation of the hereditary mechanism in the cases where the rule is followed is both plausible and attractive. The exceptional occurrence of mixed broods in *Limnaea* and *Partula* would indicate that the hereditary procedure postulated by Sturtevant is not invariable, and that there are unusual circumstances under which additional factors may operate so as to produce other than the expected results.

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The oriented wedge theory of emulsions: distribution of sizes in emulsions produced by oleate soaps: WILLIAM D. HARKINS and ERNEST B. KEITH. In an earlier paper (1917) it was indicated that the shape of the soap molecules in the interface between water and oil is an important factor in the determination of the sizes of the drops in emulsions and also of the type of emulsion as oil dispersed in water, or water dispersed in oil. Finkle, Draper and Hildebrand determined the distribution of sizes for benzol dispersed by sodium, potassium and caesium palmitate as 5.0, 3.7 and 2.5 microns, respectively, at the peaks which represent the greatest number of drops of a certain size. We find: (1) The size of the drops of the emulsions is highly dependent upon the nature of the oil which is dispersed. Thus the peak for the greatest number of drops for sodium oleate as an emulsifying agent comes at 1.94 microns in benzol and mesitylene, 3.9 microns in octane and 9.2 microns in stanolax. (2) The peaks lie on an equilateral hyperbola. In octane the sizes for lithium, sodium, potassium and caesium oleates are: 4.7, 3.9, 2.9 and 1.95 microns at the respective peaks. In stanolax the sizes for sodium, potassium and caesium oleates are: 9.2, 6.9 and 4.6 microns. (3) Bases, salts and oleic acid produce marked changes in the size. Their effect is to greatly reduce the size of the drops. (4) The oil drops are negatively charged. The potential difference be-

tween the oil drops and the water is 60 millivolts for a sodium oleate and nearly the same for a caesium oleate emulsion of octane. The addition of sodium hydroxide greatly reduces this P. D. Various other relations of emulsions will be presented.

Interfacial tension in systems of importance in connection with emulsification: WILLIAM D. HARKINS and W. A. THOMAS. Baneroff and Clowes have shown that salts produce marked effects upon the interfacial tension between water and oil when a soap is adsorbed at the interface. Clowes' results are expressed as the number of drops formed from a certain pipette, and can not be transformed into surface energy values. The writers have carried out measurements by the use of water 0.001 molar with respect to sodium hydroxide, which was dropped into purified stanolax which was 0.001 molar with respect to oleic acid. The interfacial tension was found to be 7.2 dynes per cm at 20°, while when pure water is dropped into pure oil the value is 31.05. When the solution of the base is made 0.15 molar with respect to sodium chloride the interfacial tension is reduced to 0.00 dynes per cm, or a value too small to be measured with the apparatus then available. With olive oil the corresponding value was 0.023. With 0.001 M. sodium hydroxide and 0.0015 M. calcium chloride the surface tension is increased to 9.65, while when both sodium and calcium chlorides are present with respective concentrations 0.15 M. and 0.0015 M. the value is 7.48. This value keeps nearly constant if the two salts are increased in concentration, but with the ratio of the concentrations kept at 100 to 1. As has been pointed out, sea urchins will live in salt solutions in which the ratio of sodium to calcium chloride is 80 to 1, but not in water in which only one of these salts is present.

Plasticity and melting points: EUGENE C. BINGHAM, L. T. BROWN MILLER and NORMAN WIGGINS. The melting point of a substance often depends upon the flow of the material. There are three softening temperatures to be distinguished and the solidifying point is often quite different from the melting point. The measurement of the plasticity of materials through the softening range makes possible more precise measurements of the transition temperatures than heretofore.

Plasticity and solubility: EUGENE C. BINGHAM and J. K. ROSS. When a colloid is described as being more soluble in one solvent than in some other, the difference depends upon the flow of the materials. It is suggested that the yield value may be a measure of insolubility. As the temperature is raised the solubility becomes infinite. Is the solution a "true solution"?

Suspensions vs. emulsion colloids: EUGENE C. BINGHAM and C. RAYMOND HOOD. Polar and non-polar colloids are quite sharply distinguished by means of the plastometer. The yield value in suspensions has been found to be independent of the dimensions of the plastometer but this is not true of polar colloids. This latter peculiarity has not before been noted.

Viscous liquids for viscometer calibration: EUGENE C. BINGHAM and H. R. ARNOLD. There is need for pure substances which do not absorb water or otherwise change in fluidity, whose fluidity is about that of lin-