getting that many of these attributes exist because they are properties of protoplasm. The tendency to regard the protoplasm of more primitive forms of life as less intricate, less responsive, if not "less living" than that in more highly developed forms is evident in such statements as, "there is considerable objection to the use of the word 'injure' in reference to plants." I recall the delightfully courteous remark of the English chemist, H. R. Proctor, who, finding my mechanistic interpretations of protoplasmic behavior rather harsh, asked if he might not still be allowed to regard life as, so to speak, a new departure.

In my turn, I ask the reader merely to admit that protoplasm is alive, for in so doing he tacitly grants that it exhibits irritability, in other words, nervous response.

It is interesting to contemplate the possible relationship between the rhythmical pulsations responsible for protoplasmic streaming in myxomycetes and the rhythmical contraction of sympathetically controlled muscle-tissue.

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IN-VITRO SYNTHESIS OF LACTOSE

RECENT work by Graham and Turner, working with goats, and the undersigned, working with dairy cattle, have shown that the active mammary gland removes lactic acid from the blood. The inactive mammary gland does not remove lactic acid. The quantity of lactic acid removed from the blood is such that lactic acid was suspected of being concerned with the synthesis of lactose in the milk. Galactose, which with glucose forms the lactose molecule, can theoretically be accounted for by the condensation of two molecules of lactic acid.

Proof of the correctness of the hypothesis that lactose is synthesized from lactic acid and glucose would lie in in-vitro synthesis of lactose from lactic acid and glucose. Solutions of glucose with lactic acid and various salts of lactic acid were prepared, to which was added macerated mammary gland tissue from lactating cows. This was incubated under toluene at 37° C. The mammary gland tissue was squeezed in muslin bags before and after grinding to express, in so far as possible, the milk retained in the ducts and aveoli. Blanks containing only mammary gland tissue and water incubated simultaneously with the experimental lots showed but the faintest traces of lactose.

Positive proof of the synthesis of lactose was established by the formation of lactosazones and by the isolation of 847 milligrams of material shown to be lactose.

Heating concentrated solutions of lactic acid or salts of lactic acid with glucose also produced lactose as indicated by osazones.

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THE USE OF MUCUS BY MARINE PLANKTON FEEDERS

WITH the exception of the crustacea, and perhaps the protozoa and sponges, apparently *all* the marine plankton feeders make use of mucus to entangle the microscopic materials upon which they live. This fact seems to have been overlooked by zoologists in general. After many years of study and reference work I have found that the rôle of mucus as an essential part of the feeding mechanism of marine animals has been greatly underestimated.

In 1928 I described the feeding habits of the gephyrean, *Urechis caupo,* in joint papers with Dr. W. K. Fisher,[1, 2] in which he gave the classification and description of the worm. At that time this method of feeding was considered unique by those biologists who became acquainted with the paper; but I have since found that this method is not unique, for other animals use a similar method of entangling their food, for example, *Chaetopterus variopedatus* and the tunicate, *Diplosoma macdonaldi.* In the case of many other animals in which the cilia have been credited with the selective function of obtaining food, I have found that the mucus forms a plate through which water is strained, and actually the cilia furnish only the mechanical power for creating the currents. One reason why mucus has not heretofore been accredited with its important rôle is that it is perfectly transparent, unless heavily laden with food; and another reason is that investigators have used such materials as carmine, India ink, etc., which, in most cases, cause a cessation of the secretion of mucus. Hence, what the investigators have done is to make plots of the ciliary currents, which often were reversed from what they actually are during feeding operations.

I have found that the method of feeding in *Chaetopterus* is by the secretion of a slime bag or funnel through which all water entering the burrow during feeding passes. As the bag is being secreted at the top by the aliform notopodia, it is rolled into a ball at the bottom by the accessory feeding organ; but at intervals secretion of slime ceases and this food ball is passed forward to the mouth, after which a new slime bag is formed. Therefore, the actual operation of food getting by *Chaetopterus* is quite different from that described by Enders,[3] whose paper is by far the

[1] W. K. Fisher and G. E. MacGinitie, *Ann. Mag. Nat. Hist.*, ser. 10, Vol. 1, pp. 204–213, 1928.
[2] *Ibid.*, Vol. 1, pp. 199–204, 1928.
[3] H. E. Enders, *Jour. Morph.*, 20: 3, 479–532, 1909.

most complete of many written on the natural history of this worm. It exemplifies a case in which mucus was overlooked in attempting to determine the feeding method of a plankton feeder.

A slime net is as efficient as any structure that one may imagine, for, though a dye in solution will pass through it as though it were not there, the slime net will entrap the smallest particles which are visible by the aid of an oil immersion lens. With bottom feeding forms this microscopic material consists in large part of bacteria. In SCIENCE, 1932,[4] I gave an account of a successful feeding experiment in which a pure culture of bacteria was used by a mud flat animal, and it is difficult to think of any structural device other than such a mucus net which would screen bacteria from water. The abundance and availability of marine bacteria for food have since been confirmed by ZoBell and Anderson[5] and other marine bacteriologists.

Apparently little is known of the chemical composition of mucin, particularly in the lower animals, and I believe nothing is known of its physical characteristics. A detailed account of the use of mucus by plankton feeders is in the process of preparation and should be ready for publication within the next year.

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DIET AND RESISTANCE TO COLDS

SPIESMAN and Arnold recently[1] reported their observation that carbohydrate restriction reduces the incidence of colds, and they pointed out that Paton[2] and Orr and Gilks[3] made similar observations. I recently[4] also had occasion to refer to previous reports on this subject made by McQuarrie[5] and Higgins[6] as well as by Paton and by myself.[7] However, Spiesman and Arnold state that they have no explanation to offer for the beneficial results obtained by carbohydrate restriction, although McQuarrie, Higgins and I attributed the benefits to a reduction in tissue hydration. Adlersberg and Porges[8] likewise noted the dehydrating effect of a low carbohydrate diet and found that it "can be employed with good success not only in edemas of various origins but also in inflammatory exudates, for limitation of the quantity of sputum in bronchiectasis and, finally, as an 'antiphlogistic diet' in certain inflammatory processes."[9] Before this, Glasscheib[10] advocated the use of acid salts and vitamin D to reduce hydration for the control of vasomotor rhinitis. Glasscheib, however, distinguished between vasomotor rhinitis and common colds, which he still[11] believed were due to infection and not preventable by a dehydrating regimen. Nevertheless, Glasscheib's ideas are pertinent to the subject in view of the fact that Speisman and Arnold emphasize the rôle of vasomotor responses in susceptibility to upper respiratory infections.

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CORRELATION OF RIVER TERRACE REMNANTS

RIVER terrace remnants have been correlated on the basis of their absolute elevations as obtained by approximate or precise measurement. Such correlation involves the assumption that the relief of the ancient flood-plain from which the terraces were derived was negligible.

Geomorphic studies[1] of flood-plains of present-day rivers show that the magnitude of their relief may often be sufficient to throw doubt on such correlations. It can be demonstrated, for example, that two terrace remnants differing seventy-five feet in their relative elevation may represent portions of the same ancient surface of deposition.

Typical flood-plains are normally diversified by such features as bars and swales, abandoned channels, natural levees of the main stream and its tributaries, meander scars and minor depositional features. This multiplicity of possible forms and their occurrence spatially in any order produce a terrain of unpredictable irregularity. Upon this terrain unadjusted tributaries may deposit alluvial fan material of varying thickness and extent.

It is apparent that the maximum relief of the flood-plain, excluding effects due to deposition by lateral tributaries, is limited, though not necessarily determined, by the maximum possible range of the major water plane. An examination of large-scale contour maps showing details of flood-plains of several major rivers has established the fact that the absolute relief, as measured from the low-water surface of the master stream, may exceed fifty feet and often averages twenty-five feet. In the case of small graded streams

[4] G. E. MacGinitie, SCIENCE, 76: 1978, 490, 1932.
[5] Claude E. ZoBell and D. Quentin Anderson, *Bull. Am. Assoc. Petrol. Geol.*, 20: 3, 258–269, 1936.
[1] *Am. Jour. Dig. Dis. and Nutrition*, 4: 438, 1937.
[2] *Brit. Med. Jour.*, 1: 738, 1933.
[3] Med. Research Council. Special Report No. 155, 1931.
[4] *Jour. Amer. Med. Assoc.*, 108: 2156, 1937.
[5] *Jour. Nutrition*, 2: 31, 1929.
[6] *New England Jour. Med.*, 203: 145, 1930.
[7] *Proc. Soc. Exp. Biol. and Med.*, 25: 454, 1928, and SCIENCE, 68: 301, 1928.
[8] *Klin. Wochenschr.*, 12: 1446, 1933.
[9] Quoted from abstract in *Jour. Amer. Med. Assoc.*, 101: 1766, 1933.
[10] *Monatschr. f. Ohrenheilkunde*, 62: 168, 1928.
[11] Personal communication, dated November 26, 1928.
[1] Pursued as a university fellow of Columbia University, in consultation with Professor Douglas Johnson.