tion with the hyperplasia of the connective tissue stroma. Giant cells are frequently found associated with these cysts.

Light of certain wave-lengths appears to bear a definite relationship to the physiology of the parathyroid glands. In the absence of the optimal light factors, an attempt is made by the organism to compensate for this loss by an increase in the total functional activity of the gland. Hyperplasia ensues in the absence of the lesser wave-lengths of sunlight but such hyperplasia is partially obviated by the addition to the diet of a small portion of cod-liver oil. These experiments indicate that normal development of the parathyroids will best maintain in the presence of both the lesser and the greater wave-lengths of sunlight.

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A NEW TYPE OF ACID CARBOHYDRATE FROM SEAWEED

NATURALLY occurring acidic materials, essentially carbohydrate in nature, have been known for many years, though they have been investigated comparatively little from the standpoint of structural chemistry. We know little more about the chemistry of gums than was known by the chemists of thirty years ago. Many gums occur in nature as inorganic salts of complex organic acids, which on hydrolysis break down to mixtures of both pentoses and hexoses, and form also acidic products of unknown composition. That these acidic substances are *uronic* acids or polymers or derivatives of such acids is indicated by the fact that they liberate CO_2 when boiled with 12 per cent. HCl and that they give the naphtho-resorcin test.[1] That conjugated *uronic* acids are constituents of many polysaccharides found in plants is indicated by the work of various investigators, among them Nanji and others,[2] Erich Schmidt and coworkers,[3] Schwalbe and Feldtman,[4] and also by unpublished observations of the present writers.

Of late certain substances of this general class, namely, the pectins and the soluble specific substances produced by various types of pneumococcus have been submitted to careful study with interesting results. Ehrlich[5] and his coworkers have found that digalacturonic acid is formed by hydrolysis of pectin, along with sugars—mainly arabinose and galactose—and that this acid or polymers of it constitute a considerable proportion of the pectin molecule. Very recent work by Heidelberger and Goebel[6] shows an aldobionic acid—glucoso-glucuronic—to be the fundamental building stone of the polysaccharide derived from Type III pneumococcus and to be an important constituent in that from Friedlander's bacillus.

We are now able to report, in a preliminary way, a new type of carbohydrate material which apparently is made up completely of *polyuronic* acid. Quantitatively, at least, this material bears the same relation to *uronic* acid that starch does to glucose.

A sample of seaweed, gathered at Woods Hole, Massachusetts, in April and classified as *laminaria agardhii*, was extracted with cold dilute Na_2CO_3. After filtering, the so-called alginic acid was precipitated by addition of HCl and freed from salt by washing and dialysis. It was dried over P_2O_5 to constant weight and analyzed. The results of analysis indicate the formula $(C_6H_8O_6)n$, which is also closely checked by titration with standard alkali. The compound loses 24.5 per cent. of its weight as CO_2 on boiling with dilute HCl. This indicates that the molecule is at least 98 per cent. *uronic* anhydride, probably even more, as the loss of CO_2 from a *uronic* acid is said to be not quite quantitative.[7]

We have also isolated alginic acid from *macrocystis pyrifera*—the giant kelp of the Pacific coast. Our work to date indicates that this material is also a polyuronic anhydride to the extent of at least 98.6 per cent.

But little study, beyond the determination of the analytical data, has been made of the alginic acid from *laminaria agardhii*. Enough work has been done, however, with that from the *macrocystis pyrifera* to indicate that it is a very interesting substance, worthy of careful investigation. The pure acid does not reduce Fehling's solution, but becomes reducing if dried at 100° or if boiled with distilled water for a short time. By the action of heat in the presence of water, the substance loses CO_2. Because of these facts, it is our opinion that the analytical data and physical constants, obtained by previous investigators[8] working with this material, may be inaccurate. Changes were undoubtedly brought about in the substance, before it was analyzed, on drying at 100°.

Schmidt and Vocke[9] have recently isolated what they considered to be a mixture of polyglucuronic acids from *fucus serratus*. These acids, as they found them in the plant, were bound with varying amounts of other carbohydrates. They obtained, on hydrolysis of this material, an acid whose cinchonine salt

[1] Tollens, *Ber.*, 41, 1788, 1908.
[2] *J. Soc. Chem. Ind.*, 44, 253T, 1925.
[3] *Ber.*, 58, 1394, 1925.
[4] *Ber.*, 58, 1534, 1925.
[5] *Biochem. Z.*, 168, 263, 1926; *ibid.*, 169, 13, 1926.
[6] *J. Biol. Chem.*, 74, 613, 1927; *ibid.*, 74, 619.
[7] Nanji, Paton and Ling, *loc. cit.*
[8] Hoagland and Lieb, *J. Biol. Chem.*, 23, 287, 1915.
[9] *Ber.*, 59, 1585, 1926.

melted at 204°, the melting-point of the cinchonine salt of glucuronic acid as reported by Neuberg.[10]

We have hydrolyzed the alginic acid from *macrocystis*, following exactly the method of Schmidt and Vocke, and have obtained a substance having the properties of a hexonic aldehyde acid. Its cinchonine salt melts at 152°. The acid is, therefore, not glucuronic. That this is the case is also indicated by the fact that on oxidation with bromine or nitric acid no saccharic acid was obtained.

The absence of mucic acid in the oxidation products also excludes galacturonic acid as the structural unit of the original material.

Glucuronic and galacturonic acids are the only aldehyde sugar acids hitherto found in nature.

We are continuing work on the chemistry of plant gums and the acidic portions of the algae, and will report more fully in a short time.

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SOCIETIES AND ACADEMIES

THE THIRTY-EIGHTH ANNUAL MEETING OF THE OHIO ACADEMY OF SCIENCE

THE thirty-eighth annual meeting of the Ohio Academy of Science was held at the University of Cincinnati, Cincinnati, O., on Friday and Saturday, April 6 and 7, 1928, under the presidency of Dr. Harris M. Benedict, of the University of Cincinnati. The attendance was good, the atmosphere notably congenial, the programs well balanced, the public lectures and sectional papers highly satisfying, and the hospitality of the City of Cincinnati generous and winning. The central theme of the meeting was the relation between physics and biology, as emphasized by the presence and notable lecture of Dr. William T. Bovie, of the Medical College, Northwestern University, on "The Relation of Physics to Biology," the lecture by President Schneider on results from the Basic Laboratory of the University of Cincinnati, the lecture by Dr. S. J. M. Allen on the use of the X-ray as a means of investigating the structure of protoplasm, the lecture by Dr. Albert P. Mathews on some aspects of the problem of coagulation of the blood, and the lecture by J. B. Kelly, of the Bell Telephone Laboratories of New York, on "Recent Researches in Audition." In addition, there were some 85 or 90 papers read before sectional meetings.

The officers elected for the coming year were: *President,* James S. Hine, Ohio State University; *vice-presidents,* zoology, Annette Braun; botany, E. Lucy Braun; geology, Charles H. Behre, Jr.; medical sciences, Albert P. Mathews; psychology, Samuel Renshaw; physical sciences, E. H. Johnson; *secretary,* William H. Alexander; *treasurer,* A. E. Waller; *elective members of the executive committee,* R. C. Osburn and Stephen R. Williams; *trustee research fund,* George D. Hubbard.

Fellowship was bestowed upon the following members: Chas. H. Behre, Jr., Fred A. Hitchcock, Robt. A. Moore, Katharine Dooris Sharp, John P. Visscher and Frank J. Wright, and some 60 or more new members were elected.

The academy went on record as unanimously in favor of H. R. 6091, Seventieth Congress, first session, by Mr. John McSweeney, M. C.

WM. H. ALEXANDER,
Secretary.

SIGMA PI SIGMA CONVENTION

SIGMA PI SIGMA, national honorary physics fraternity, held its convention at Davidson College, Davidson, N. C., April 10 and 11. The reports of the national officers and the delegates from the various chapters showed growth in the strength of the fraternity and an increasing interest in its work. Chapter representatives were present from Davidson College, Duke University, the Pennsylvania State College, Furman University, Centenary College and the College of William and Mary. All the officers and members of the Executive Council were present, as follows: *President,* R. W. Graves; *vice-president,* Marsh W. White; *secretary-treasurer,* H. E. Fulcher; *councilors,* J. M. Douglas, W. N. Mebane and C. C. Hatley.

At the conclusion of the business session on the afternoon of April 10 Professor R. C. Young, of the College of William and Mary, presented a paper on "The Use of the Vacuum Tube Oscillator in Making Laboratory Measurements."

At an open meeting at 7:30 P. M. Professor J. M. Douglas gave a short talk on "The Aims and Ideals of Sigma Pi Sigma." Professor McConnel, of Davidson College, welcomed the fraternity upon behalf of the faculty and the administration of the college. The principal address of the evening was given by Dr. Marsh W. White, of the Pennsylvania State College, upon the subject: "The Energy Relations in X-ray Tubes."

Officers were elected at the business sessions on April 11 as follows: *President,* Professor C. C. Hatley, of Duke University; *vice-president,* Professor R. C. Young, of the College of William and Mary; *secretary-treasurer,* Professor Marsh W. White, of the Pennsylvania State College; *councilors,* Professors J. M. Douglas and W. N. Mebane, of Davidson College.

[10] *Ber.,* 33, 3317, 1900.