

Almost one half of the total yield is found in water from 1 m. to 3 m. in depth. More than one quarter is found in water shallower than this, and a quarter in deeper water (3 m. to 7 m.).

Almost one half of the wet weight of the total yield is made up of *Vallisneria spiralis*. The dry weight of this plant forms a somewhat smaller fraction of the whole, owing to its relatively high water content. The remainder of the vegetation is composed mainly of various species of *Potamogeton*. *P. amplifolius* composes about one quarter of the total, *P. pectinatus* and *P. Richardsonii* each about one tenth. None of the remaining species exceeds 4 per cent. of the total.

The above is an average for the whole plant zone. At different depths the situation varies. *Potamogeton pectinatus*, *P. Richardsonii*, and other species, including *Najas flexilis*, *Ranunculus aquatilis*, and *Chara crista*, bulk large in water less than 1 m. in depth. Between the depths of 1 m. and 3 m., *Potamogeton amplifolius* replaces to a large extent the other species of this genus, and *Myriophyllum* and *Ceratophyllum* are abundant. In the deepest water (3 m. to 7 m.), *P. amplifolius* composes about one half of the entire vegetation. *Vallisneria* forms a large part of the growth at all depths.

The greater the depth, the smaller is the number of species. Many plants are restricted to the shallow water. Among these are *Ranunculus* and the rare species *Potamogeton lucens*. On the other hand, most of the *Potamogeton zosterifolius* is found in water deeper than 3 m., and about three quarters of the *Myriophyllum* and *Ceratophyllum* is found in water from 1 m. to 3 m.

Within each depth-zone, the abundance of the vegetation is different in different stations. The figures obtained represent, therefore, averages of widely varying conditions. Much of this difference is correlated with the character of the lake bottom. Especially in the shallowest water, there are large tracts of sandy bottom, on which *Potamogeton pectinatus*, *P. Richardsonii*, *Ranunculus*, *Najas*, and *Chara* thrive, while other species do better in

muddy regions. *Vallisneria* flourishes equally on mud or on sand. Both the character of the bottom and the nature of the flora are more uniform in the deeper water.

In addition to the plant zone as a whole, there are a large number of shallow bays which have distinctive flora. Here grow a number of marsh and pond plants not found elsewhere in the lake, including *Scirpus lacustris*, *Castalia odorata*, *Nymphaea advena*, *Typha latifolia*, and other less common species. Almost all the other species found in the lake are also present in the shallow bays. Here also the character of the vegetation varies considerably with the nature of the bottom. Quantitative determinations of this class of cases were very difficult to make, owing to the irregular, patchy nature of the growth, especially in the case of the larger marsh plants.

Around the margin of the lake extends a narrow strip of *Cladophora glomerata*, growing attached to rocks of various sizes. This plant varies greatly at different points in the density of its growth. Samples were collected from representative spots, field notes taken on the general distribution and abundance of the species, and an estimate of the total made on the basis of these data.

A detailed report of these investigations is to be published in the *Transactions* of the Wisconsin Academy of Sciences, Arts, and Letters.

H. W. RICKETT

DEPARTMENT OF BOTANY,
UNIVERSITY OF WISCONSIN

THE AMERICAN CHEMICAL SOCIETY

(Continued)

DIVISION OF DYE CHEMISTRY

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Wednesday and Thursday

Physiology Lecture Room

New naphthalene dyes; A. S. WHEELER. The tones produced vary with the reaction of the bath and also may be modified considerably by the use of mordants. The sulfonation of naphthalene with fuming sulphuric acid, is carried out at a low temperature and is so regulated that the

naphthalene 1, 5-disulfonic acid is obtained. This is fused with caustic soda and the resulting naphthol is oxidized with chromic acid to juglone. This hydroxynaphthoquinone yields a wide variety of halogen derivatives; additional products at low temperatures, and substitution products at high temperature. These are dyes since they contain both the chromophore and auxochrome groups. Both chlorine and bromine derivatives of juglone have been prepared. Tribromojuglone is obtained in yields of nearly 100 per cent. of the theoretical, is rich red in color while its sodium salt is indigo blue. The new work in this field includes the preparation of some ethers. Methyl ether, brick red crystals, its sodium salt being difficult to prepare; ethyl ether, yellowish red needles, its sodium salt being readily made. The influence of the alkyl radicles is to cause the dyes to become reddish in tone.

Applications of maleic and fumaric acids and their salts in the textile industry: J. H. CARPENTER. This paper gives a brief outline of the excellent results obtained with the use of maleic and fumaric acids when used as mordanting assistants in the chroming of wool, and briefly points out the real commercial possibilities for these acids. The subject of their use in the scrooping and dyeing of silk is taken up and some positive results pointed out in that field. The uses of maleic acid in cotton printing are mentioned and the reasons why negative results were sometimes gotten are briefly enumerated. The application of these acids in dyeing various materials with special colors are discussed and the results gotten in using them for dyeing of leather are mentioned.

The anilides of beta oxy naphthoic acid: E. R. BRUNSKILL. If instead of beta-oxy-naphthoic acid, the anilide is used for dyeing by the ice process the colors produced are brighter in shade and much faster to washing. A comparison is made of beta-oxy-naphthoic acid, the anilid, toluidine and p-chloranilide, coupled with aniline, p-nitraniline, para-toluidine, meta-nitro-para-toluidine, parachloraniline-o-sulfonic acid, and o-chlor-p-toluidine sulfonic acid.

The education of the research chemist: ROBERT E. ROSE, PH.D. The research men turned out by the educational system of this country are excellent—this has been shown by the way the dye chemists have succeeded. If fault can be found with the system, it is with its failure to train the scientists systematically during childhood, and with the emphasis placed on memory courses and sec-

ond-hand data. We shall have a higher average of research attainment when we appreciate the national importance of the grade school teacher and give the calling the dignity it merits. Our universities need to escape from "text-book" teaching and our research geniuses need to be freed from routine duties—though research is only the use of the results of accurate observation as material for logical reasoning; yet to produce those who can observe rightly and think clearly is the most difficult educational problem. The American Chemical Society might aid materially by organizing a section devoted to research training where teachers and technical men could exchange views.

Extraction of resorcinol from the alkali melt: HARRY MCCORMACK. The object of the investigation reported herewith was to determine some more economical method of separating resorcinol from aqueous sodium sulphate solution obtained from the neutralization of the alkali melt in which sodium resorcinate is produced, than the customary practise of extracting with ether, or with ether and benzene. The method worked out effects the separation of resorcinol from the sodium sulphate, sodium sulphite solution, by evaporating the solution to such concentration that practically all the sodium sulphate crystallized, leaving all of the resorcinol in solution. The resulting solution is evaporated to complete dryness, pulverized and the resorcinol extracted from the dry mass by treatment with ethyl alcohol or other suitable solvents for resorcinol in which sodium sulphate and sodium sulphite are insoluble. It is found that with a 72 per cent. alcohol solution sodium sulphate is insoluble. Such an alcohol solution dissolves the resorcinol to the amount of more than 50 per cent. of the alcohol used and from this alcohol solution it is easy to secure the resorcinol by distilling off the alcohol and then purifying the resorcinol by vacuum distillation. Solvent loss amounts to $1\frac{1}{2}$ to $2\frac{1}{2}$ per cent. of the weight of the resorcinol.

Photosensitizing dyes: LOUIS E. WISE.

The preparation of lepidine and related bases: LOUIS A. MIKESKA. Recent developments in the field of photosensitizing dyes have brought lepidine and related bases again into prominence. A procedure is given for the preparation of lepidine, p-tolulepidine and p-ethoxylepidine.

Isocyanine dyes from lepidine and its homologs: ELLIOT Q. ADAMS and HERBERT L. HALLER. The

quaternary addition products of sufficiently pure lepidine (or homologs of lepidine) give when treated with alcoholic alkalis in hot, concentrated solution, dyes of the isocyanine type, similar to, but not identical with, those given by the corresponding derivatives of quinaldine. The preparation of 5 such dyes is described. The formation of isocyanines from lepidine confirms the hypothesis, now generally accepted, that these dyes contain two quinoline nuclei attached to a central carbon atom in positions 4 and 2, respectively.

Kryptocyanines: A new series of photosensitizing dyes: ELLIOT Q. ADAMS and HERBERT L. HALLER. A new type of photosensitizing dye having an absorption maximum near 7,000 Å. and a sensitization maximum near 7,400 Å. is described. These dyes are formed by the action of alcoholic alkali and formaldehyde (or chloroform) on the alkyl halides (or other quaternary addition compounds) of (sufficiently pure) lepidine and its homologs. Dyes of the same or similar type are produced under some circumstances in the absence of formaldehyde or chloroform. Tentative suggestions are made as to the structure of these dyes. The name "kryptocyanine" is suggested.

Synthesis of photosensitizing dyes (II.), dicyanine A.: L. A. MIKESKA, H. L. HALLER and E. Q. ADAMS. Directions are given for the preparation of 2, 4-dimethyl-6-ethoxyquinoline from p-phenetidine; for the preparation of the ethiodide of this base, and, from it, the nitrate and iodide of Dicyanine A.

Naphthalene sulphonic acids. III. An alternative method for the qualitative detection of naphthalene 2-7 and 1-6 disulphonic acids. J. A. AMBLER. In naphthalene sulphonic acids. II. A method for the qualitative determination of some of the naphthalene sulphonic acids, by J. A. Ambler and E. T. Wherry, read at the meeting of the American Chemical Society at St. Louis in April, a method of detecting naphthalene 1-6 and 2-7 disulphonic acids by a microscopic examination of their β -naphthylamine salts, was given. It is also possible to detect these two acids in mixtures by the different solubility of their β -naphthylamine salts in 4 volumes of 95 per cent. alcohol and 1 volume of water, the 2-7 salt being more insoluble. The 1-6 acid is detected by converting to the sodium salts and subsequent treatment with sulphuric acid, in which the sodium salt of the 1-6 acid is more insoluble.

An investigation of the N. S. Passay of phosphoric acid and soluble phosphates: A. E. STEARN, H. V. FARR and N. P. KNOWLTON. The N. S. P. method is incapable of yielding true results except at one specific concentration, namely, 6.2 mg. per c.c. of P_2O_5 in sol. The error varies from about +3 per cent. at a concentration of .62 mg. per c.c. to -8 per cent. at a conc. of 10.9 mg. per c.c. This is probably due to the formation of acid phosphates of silver which are slightly soluble, the amount formed increasing rapidly as the phosphate concentration is increased and the excess of silver nitrate is simultaneously decreased. By modifying the method to the extent of transforming the acid to the tri-sodium salt results are obtained which coincide with the results yielded by the pyrophosphate method and are independent of the concentration.

The production of American storax from the red gum tree: S. A. MAHOOD.

Detection of some substituted sulphonic acids: D. F. J. LYNCH. In the work on substituted sulphonic acids in this laboratory, the need of some quick method of detection and identification for such acids as 1-8 dinitro naphthalene 3-6 disulphonic acid, 1-8 diamino naphthalene 3-6 disulphonic acid, 1-amino 8 naphthol 3-6 disulphonic acid (H acid), and 1-8 dihydroxy naphthalene 3-6 disulphonic acid (chromotrope) was felt. Mixtures of these acids were encountered in our work on the nitration of 2-7 naphthalene disulphonic acid and the subsequent reduction and hydrolysis of the nitro compound formed. Each of these four acids can be identified in the presence of the other three by the formation of salts with organic bases.

Benzene disulphonic acid from benzene monosulphonic acid: C. E. SENSEMAN. Barium benzene monosulphonate is treated with concentrated sulphuric acid at temperatures of 220°, 250° and 280°. The quantities of acid used range from 50 per cent. excess to 700 per cent. excess. The duration of the various experiments is from 8 to 10 hours. The progress of the reaction is determined in each case by removing a sample at the end of each hour and analyzing for the disulphonic acid. Vanadium pentoxide and sodium sulphate are tried out as catalysts. In some cases an increased yield of 20 per cent. results.

Qualifications of organic chemists: M. L. CROSSLLEY. Uniformity of action by men who employ chemists in passing upon their qualifications is

especially needed. In addition to the training which a man receives fitting him as a chemist, he should also have a definite amount of experience before he is considered a chemist to qualify as such and should have a university training or its equivalent in the fundamentals of chemistry, physics and mathematics, and in addition, have had at least five years experience in a research laboratory connected either with the university or an industry. This can best be accomplished by appointing men who have just been graduated as junior chemists to be advanced to assistant chemist after two years of satisfactory work under the direction of senior chemists. From the assistant grade appointment should be made as a chemist after satisfactory evidence has been given by assistant chemist of his ability to understand and appreciate the responsibility to his profession in rendering efficient and accurate service. The title of chemist should carry with it distinction and should not be lightly given to men whose qualifications do not fit them for the kind of service which the chemist should render to his profession.

Laboratory equipment: C. V. OGILVIE, G. S. SIMPSON, M. L. CROSSLEY. In order to secure accuracy and efficient results in analysis in organic research laboratories it is imperative that we use standard equipment in which the factor of equipment error is reduced to a minimum. We propose two such pieces of standard equipment for laboratory purposes, first, a diazotization burette. This is a jacketed burette which can be cooled to any desired temperature by circulating brine and which can be used for diazo solutions easily decomposed by light. The burette is similar to a condenser of the shellback type, having a blue line on a white background. The lower end of this burette should be made of capillary tubing so that only a small volume of solution is held in this portion of the burette. The burette is sealed in a condenser tubing, care being taken to avoid an exposure of much of the burette surface. The inlet and outlet tubes for circulating the brine solution through the jacket are so placed as to allow the water to surround the entire burette. It is protected from the direct rays of the light by standing the jacket leaving only sufficient exposed surface of the jacket to enable the operator to read the volume of the solution. The same thing can be accomplished by using a colored solution for cooling the jacket. Second, a standard stirring equipment for use with volatile liquids. We propose laboratory stirring equipment to be used

for either the extraction or mixing of volatile liquids consisting of a wide mouth flask fitted with thermometer and glass stirrer driven by a shaft which extends through a condenser. This vertical shaft is driven from a 1" horizontal shaft 36" above the bench. The vertical shaft is supported from the wall by iron bearings and placed 7" from the horizontal shaft. By proper adjustment of the driving pulleys, one can carry on stirring at different heights from the operating bench. The bearings are of glass and the pulleys of wood. The pulleys have three speeds and are driven by 1/8" leather belting. This type of equipment does away with the necessity of mercury seal which is usually necessary in work of this kind and which frequently contaminates the reaction mass.

Action of sulfuric acid on nitro carbocyclic compounds: M. L. CROSSLEY. Certain nitro compounds react with sulphuric acid under certain conditions with explosive violence producing aminophenol, sulfonic acids and complex compounds of unknown composition. The reaction is exothermic and is quite general. The temperature at which the reaction takes place is just a few degrees above that at which the substances remain in contact unchanged. It is the purpose of this paper to emphasize the dangerous character of this reaction, especially when the reaction mass is large and is confined in a vessel with a closed top. On a manufacturing scale it is extremely difficult to control this reaction and it should be guarded against in processes where it might be secondary to some main reaction. A few months ago this reaction was brought about by accident in a plant in this country and it resulted in a bad explosion in which several men were badly injured and one man killed. It is hoped that other manufacturers will profit by this experience and thus prevent loss of life and property which would otherwise result.

DIVISION OF INDUSTRIAL AND ENGINEERING
CHEMISTRY

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Cellulose Symposium. G. J. Esselen, Jr., *chairman*

Regenerating book-stock: CHARLES BASKERVILLE and CLARENCE M. JOYCE. Attention is directed to the enormous amounts of old magazines and books, much of which now goes to waste, although much is converted into box-board, roofing paper, etc. The term "bookstock" is applied in this communica-

tion to used paper made primarily from chemically prepared pulp. Conservation will result in reworking more paper wastes. The differential in value of the regenerated pulp which goes back to bookstock or into boxboard must bear the cost of "de-inking." To conserve the strength and length of fiber and secure the greatest yield, the paper requires mechanical treatment whereby the fibers are loosened and drawn apart with minimum tearing; the chemical treatment should lift the ink, the substances used dissolving or emulsifying the binder and carrying the pigment particles away in the necessary washing. A combination of borax, soap, kerosene and pine oil, does this best; the last mentioned being a natural solvent of rosin, used as size for many kinds of paper, and a solvent and emulsifying body for gums and resins, which are present in ground wood, used in cheaper grades of magazine papers. The process has been patented.

Recovering newsprint: CHARLES BASKERVILLE and RESTON STEVENSON. With the prices obtaining, the recovery of old newspapers in such condition as to be used again for newsprint, offers an opportunity for relative conservation, if not distinct economy in fact. Methods previously devised for recovering printed papers made little or no distinction between newsprint stock and book stock. The former normally contains a large proportion of ground wood, which yellows on treatment with caustic soda, the usual basis of chemicals applied in de-inking printed paper stock. The authors, recognizing the difference in character of the fibers in the several kinds of stocks, have studied the fundamental principles involved and devised a novel method for completely de-inking newsprint stock containing a large percentage of ground wood with the minimum production of yellowing. The process developed depends upon the addition of American fuller's earth to the alkaline solution in which the printed or soiled newspapers are pulped. The binder is loosened and the ink lifted from the fibers, the oils being absorbed by and the ink particles adhering to the argillaceous earth, which is washed away from the fibers through a fine gauze screen. Temperature factors and concentrations are given. A finished pulp, free from pigment and binder, clean as when first made, has been obtained ready-made for the paper mill. If desired the stock may be bleached by treatment with dilute sulphurous acid, but this is unnecessary for ordinary newsprint stock.

On the cellulose content of various compound celluloses: LOUIS KAHLBERG. Using the ferric

chloride hydrolysis method described at the Urbana meeting of the American Chemical Society, various compound celluloses were decomposed and their cellulose content estimated. The following materials were thus investigated: (1) Woods—bass wood, birch, black walnut, cherry, hemlock, maple, redwood, red oak, white ash, Washington fir, white pine, yellow pine; (2) Straws—wheat, oats, rye, barley, millet, soy beans, corn stalks, corn husks, timothy hay; (3) Nutshells—black walnut, English walnut, hickory, filbert, Brazil, pecan, almond, peanut, horse chestnut; (4) Barks—hemlock, pine. So far as comparable results have previously been presented in the literature by others, the values obtained are found to be, in general, of the same order of magnitude as those in this research.

The constitution of cellulose: HAROLD HIBBERT.

The acid hydrolysis of sugar cane fiber and cotton seed hulls: E. C. SHERRARD and G. W. BLANCO. Sugar cane fiber and cotton seed hulls were hydrolyzed by digesting with dilute sulphuric acid under 115 to 120 pounds steam pressure. About 27 per cent. of total sugar was obtained from the bagasse and about 14 per cent. from the cotton seed hulls. Of the total sugar obtained from these materials very little was fermentable, the greater proportion being xylose. The yield of sugar from bagasse using Hudson and Harding's method was 21.22 per cent. of the original dry fiber. Of this 57 per cent. was obtained as crystalline xylose and shown to be identical with that from cotton seed hulls. Attention is called to the fact that pentose sugar influence the equilibrium established in the hydrolysis of cellulose of hexose sugars. When present in sufficient quantities they prevent the formation of fermentable sugars. It is pointed out that bagasse is a promising source of xylose or furfural.

CHARLES L. PARSONS,
Secretary

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