

The troublesome problem of the closer relation of pure mathematics to its applications: can it not be solved by indirection, in that through the whole course of elementary mathematics, including the introduction to the calculus, there be recognized in the organization of the curriculum no distinction between the various branches of pure mathematics, and likewise no distinction between pure mathematics and its principal applications? Further, from the standpoint of pure mathematics: will not the twentieth century find it possible to give to young students during their impressionable years, in thoroughly concrete and captivating form, the wonderful new notions of the seventeenth century?

By way of suggestion these questions have been answered in the affirmative, on condition that there be established a thoroughgoing laboratory system of instruction in primary schools, secondary schools and junior colleges—a laboratory system involving a synthesis and development of the best pedagogic methods at present in use in mathematics and the physical sciences.

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*THE AMERICAN ASSOCIATION FOR THE
ADVANCEMENT OF SCIENCE.*

SECTION C, CHEMISTRY.

THE meetings of Section C were held jointly with those of the American Chemical Society on December 29, 30 and 31, in the Medical Building of Columbian University. The meetings on the first two days were in charge of the officers of the American Chemical Society, Dr. Ira Remsen, president of the society, presiding. On the third day Vice-President Baskerville presided. The address of the retiring vice-president, Dr. H. A. Weber, on 'Incomplete Observations,' was delivered on Monday, December 29. The newly elected sectional officers are:

Vice-President—Dr. W. D. Bancroft, of Cornell University.

Secretary—C. L. Parsons, of Durham, N. H.

Members of the Sectional Committee—A. S. Wheeler, E. C. Franklin, M. T. Bogert, L. P. Kinneutt and L. Kahlenberg.

Among the papers read were the following:

Corrosion of some Ancient Coins: F. P. DUNNINGTON, University of Virginia, Charlottesville, Va.

About fifteen years ago the late Judge Victor Clay Barringer was living in Alexandria, Egypt, when an extensive fire occurred. After this fire he bought from a native a mass which appeared to consist of corroded copper, which he was told had been obtained from a hole in a wall where a building had been demolished in the conflagration. This compacted green cylindrical mass of about twenty pounds weight was kept as a hearth ornament, and not examined until it recently came into the possession of Dr. Paul B. Barringer, of the University of Virginia. The mass then bore the imprint of the woven bag in which it had been confined and proved to be composed of coins in various stages of corrosion.

The author was requested to clean off a number of the coins, of which there were probably 500, and so far as examined, all prove to have belonged to the reigns of the Cæsars and to have had the same composition and approximately the same weight, about fifteen grams each. The unaltered red metal consists of silver and copper, containing, as shown by several samples, almost exactly one part of silver to four of copper, which, when partially attacked by dipping in acid, loses a portion of copper and leaves a larger proportion of silver on the surface, and thereafter continues to 'wear' as a white metal, evidently having passed as 'silver coin.'

The crust of malachite which firmly bound these pieces together varied in thickness up to two millimeters, and within this there was a layer of red oxide of copper of similar thickness which is almost free of silver, containing but about one per cent. Inside of these two crusts there remained more or less of a dark spongy mass of silver, retaining a little oxide of copper which adhered to the unchanged alloy, and in some instances the latter had entirely disappeared, so that this residue of the coin was fragile while still partly retaining the imprint of the coin. The manner in which the silver was concentrated is of decided interest.

From the contents and circumstances of this find these coins had no doubt been thus stored away for nearly 1,900 years, and yet on most of them the lettering and even the dates may be deciphered.

A Convenient Form of Table for Calculations of Chemical Weights: F. P. DUNNINGTON, University of Virginia.

The author, having frequent occasion to check calculations of the amounts of substances from the weights made by students in quantitative analysis, has constructed a table to enable him quickly to obtain such results. A description of this is given to the section as a proposed accessory in teaching, which may prove instructive to the pupil and helpful to the teacher.

Upon coordinate paper 500 by 400 mm. the 500 mm. abscissa is counted as 1,000, and there is laid off upon the (vertical) ordinate the length corresponding to the figure expressing the amount of body sought for each 1,000 parts of the substance found. A straight line is then drawn from the origin to this point, as 798 for the copper in 1,000 of CuO, or 247 for the chlorine in silver chloride.

Similarly a diagonal line is drawn from the origin for each such form in which

bodies are weighed. If, then, one reads off upon the abscissa the measure corresponding to any weight of substance found, the length of the ordinate at that point which is cut off by the corresponding diagonal gives directly the amount of the body sought. For instance, .679 of MnS gives .429 of Mn.

The Action of Unsymmetrical Hydrazines on the Chlorine Derivatives of the Quinones of the Benzene Series: WILLIAM MCPHERSON, W. L. DUBOIS and C. P. LINVILLE.

The unsymmetrical acyl phenyl hydrazines react with the different chlor-quinones in the following ways: (1) A regular condensation may take place forming the corresponding hydrazones, which on saponification yield oxyazo-compounds. (2) A hydrogen atom of the quinone together with a hydrogen atom of NH₂ group of the hydrazine may be removed by the oxidizing action of the quinone, forming a hydrazino compound. (3) A chlorine atom of the quinone may combine with a hydrogen atom of the NH₂ group of the hydrazine, a hydrazino compound being formed with the evolution of hydrochloric acid.

Some New Phenomena Exhibited by Soap Solutions: H. W. HILLYER.

As the formation of bubbles is dependent on the low surface tension of soap solution, so the emulsifying power of soap solutions is largely dependent on the low surface tension between the soap solution and the oily matter removed by it. This lowering of the surface tension is, within certain limits, nearly proportional to the amount of soap in solution. Neither of the hydrolytic products of soap, *i. e.*, alkali or fatty acid, causes this lowering of the surface tension; it is a measure of the amount of soap present. Emulsification is

dependent almost directly on the smallness of the surface tension, and this largely explains the cleansing power of soap. A practical soap test from the consumer's standpoint is clearly indicated, but not yet fully worked out.

Charts, diagrams and specimens were shown.

The Composition of Spirits Produced from Grain, and the Changes Undergone by the Same when Stored in Wooden Packages: CHARLES A. CRAMPTON, Int. Rev., Treasury Dept., Washington, D. C.

Analyses are given of samples of rye and bourbon whiskeys, taken each year from packages set aside in government warehouses, for the purpose of determining the effect of time upon the composition of the spirits. The purpose of the experiments is to obtain analytical data upon which genuine whiskeys aged without foreign addition can be distinguished from spurious spirits made by coloring matter and artificial flavors to alcohol or cologne spirits. The present paper is a preliminary report of the results obtained for the first four years of storage. The experiments will be continued and complete results and conclusions published at some future date.

Some Double Salts of Organic Acids: JAS. LEWIS HOWE, Lexington, Va.

Aside from the chrom-oxalates, and oxalates of the platinum metals, few complex salts of organic acids have been studied. A qualitative investigation shows that quite a number of other acids form similar salts. A series of chrom-malonates is described. Attempts made to prepare similar complex salts of trivalent cobalt by electrolytic oxidation. Several of the double cobalto-salts are not oxidized by the electric current. A series of double cobalto-malonates were prepared and are described. These are

oxidized to complex cobalti-malonates, and these are now being studied.

Preparation of Standard Solutions of Sulphuric Acid by Direct Dilution: ARTHUR JOHN HOPKINS.

According to the table of Marignac the coefficient of expansion for sulphuric acid of sp. gr. 1.263 is found to be constant between 15° and 20°. Accordingly a stock acid is prepared as near to sp. gr. 1.263 as possible, and its exact specific gravity accurately determined.

A table is prepared for this stock acid showing at different working temperatures the exact volume necessary to dilute to one liter in order to prepare, *e. g.*, a tenth-normal acid. This table is prepared from the work of Lunge and Isler on the valuation of acid of different specific gravities and from the work of Marignac, allowance being made for the expansion of glass.

The preparation of a tenth-normal acid, consists in allowing to flow from a calibrated burette the volume of acid, indicated in the table for the working temperature, into a flask known to contain exactly one liter, and diluting to the mark.

Condensation of Triphenylmethyl to Hexaphenylethane: M. GOMBERG, Ann Arbor, Mich.

It has been established that certain halogen derivatives have the power to condense triphenylmethyl to the saturated hydrocarbon hexaphenylethane.

Methods for the Examination of Bitumens and their Determination and Separation: CLIFFORD RICHARDSON, Long Island City, N. Y. Read by title.

In the course of fifteen years' experience, in the application of bitumens in the industries, a large number of methods for the examination and determination of this material have been developed, and are de-

scribed in the paper as a contribution to the literature of the subject.

Portland Cement, Considered as a Solid Solution: CLIFFORD RICHARDSON, Long Island City, N. Y. Read by title.

While the literature on the subject of the constitution of Portland cement is very extensive, in reviewing the same the writer has discovered that the conclusions which have been arrived at are neither uniform nor supported by satisfactory evidence of a synthetic nature. He has, therefore, prepared in the laboratory all those silicates and silico-aluminates which are supposed, according to the theory of various writers, to occur in Portland cement clinker. The results of a study of these preparations under the microscope, by petrographic methods, and in their relations to water, show that many of the theories heretofore advanced are unsound, and the Portland cement must be considered to be a type of solid solution, as it presents features quite similar to those found in alloys of the metals.

A Characterization, Classification and Nomenclature of Native Bitumens: CLIFFORD RICHARDSON, Long Island City, N. Y. Read by title.

This paper has been written because of the appointment of a committee, by the International Association for Testing Materials, on the subject of the nomenclature of bitumen.

Many classifications of the native bitumens have been attempted in the past, but they have been based upon insufficient data. During the past ten years the writer has had an opportunity to examine a very large number of native bitumens, and to compare them with type specimens, which are now generally unavailable, through the exhaustion of the mines. The evidence accumu-

lated in this way forms the basis of the proposals contained in the paper.

In the course of the examination grahamite, which has hitherto been described as only coming from West Virginia, has been found to occur in an easily recognizable form in Colorado, Indian Territory, Cuba, Trinidad and Mexico; albertite, in Utah and several other localities; and various types of asphalt in some 200 or 300 different localities.

The evidence thus obtained has been carefully analyzed, and the following classification of the native bitumens deduced:

BITUMENS:

Gas:

Natural gas.

Marsh gas.

Petroleum.

Paraffine oils.

Rich in sulphur derivatives.

Poor in sulphur derivatives.

Cyclic oils.

Russian, stable polymethylenes.

Californian, asphaltic polymethylenes.

Mixed oils.

Containing both paraffine and cyclic hydrocarbons.

Maltha.

Solid Bitumens:

Originating in paraffine hydrocarbons.

Ozocerite, hatchetite, etc.

Originating in cyclic hydrocarbons.

Terpenes, fossil resins, amber, etc.

Polymethylenes and their derivatives.

Gilsonites.

Asphalts, including glance pitch.

Grahamites (asphaltites).

Individual species.

Manjak.

Uvalde County, Texas, bitumen, etc.

The grahamites rapidly shade into the pyrobitumens.

Pyrobitumens:

Practically insoluble in chloroform or heavy petroleum hydrocarbons.

1. Derived from petroleum.

Albertite, with varieties called nigrite, etc.

Elaterite.

Wurtzelite.

2. Derived from direct metamorphosis of vegetable growth.

Anthracite.

Bituminous coal.

Lignite.

Peat?

The following papers were also read:

Some of the Work of the Bio-Chemic Division, Department of Agriculture: E. A. DE SCHWEINITZ.

Does Cholesterol Occur in Corn Oil? A. H. GILL.

Miley's Color Photography: W. G. BROWN.

The Composition of Fresh and Canned Pineapples: L. S. MUNSON and L. M. TOLMAN.

Chemical Composition of some Tropical Fruits and Fruit Products: E. M. CHASE, L. S. MUNSON and L. M. TOLMAN.

Nature of the Work of the Bureau of Chemistry, Department of Agriculture: H. W. WILEY.

Iodine Absorption of Oils; Comparison of Methods: L. M. TOLMAN and L. S. MUNSON.

The Relation of the Specific Gravity of Urine to the Solids Present: JOHN H. LONG.

Derivatives of Isoapiol and Isosafrol: F. J. POND. Read by title.

Report of the Committee on Atomic Weights: F. W. CLARKE.

Report of the International Committee on Atomic Weights: F. W. CLARKE.

On the Need of Systematic Action regarding the Question of Substitution and Adulteration: LEON L. WATTERS. Read by title.

The Chemical Work of the Bureau of Soils, Department of Agriculture: FRANK K. CAMERON.

The Action of Metallic Magnesium on Aqueous Solutions: LOUIS KAHLENBERG.

Action upon Metals of Solutions of Hydrochloric Acid in Various Solvents: HARRISON E. PATTEN.

A Proposed Method of Examining Wood Treated to Resist Fire: C. F. MCKENNA.

An Electric Test Retort: C. F. MCKENNA.

The Basic Sulphates of Beryllium: CHAS. LATHROP PARSONS.

The Picrates of the Rare Earths: L. M. DENNIS and W. C. GEER.

The Chemical Work of the U. S. Geological Survey: F. W. CLARKE.

A Method for the Colorimetric Determination of Phosphates and Silicates when Both are Present: OSWALD SCHREINER.

A New (?) Meteorite from Augusta County, Virginia: H. D. CAMPBELL and JAS. LEWIS HOWE.

A Volumetric Method for the Determination of Chromic Acid in Chrome Pigments: E. E. EWELL.

Suggested Improvement in Chlorine Determination: CHAS. BASKERVILLE.

The Determination of the Hydrocarbons in Illuminating Gas: L. M. DENNIS and J. G. O'NEILL.

Reduction with Soluble Anodes: WILDER D. BANCROFT.

Solubility Curves for Magnesium Carbonate in Aqueous Solutions of Sodium Chloride, Sodium Sulphate and Sodium Carbonate: FRANK K. CAMERON and ATHERTON SEIDELL.

The Optical Rotating Power of Camphor Dissolved in Inorganic Solvents: Phosphorus Trichloride, Sulphur Dioxide, Sulphur Monochloride: HERMAN SCHLUNDT.

Report of Committee on Atomic Weight of Thorium: CHAS. BASKERVILLE.

New Syntheses in the Phenmiazine Group: MARSTON TAYLOR BOGERT.

Some Picryl Derivatives of Phenols: H. W. HILLYER.

Nomenclature of Elements and Radicals: W. G. BROWN.

Hydrochloric Acid as an Electrolytic Solvent: E. C. FRANKLIN.

H. N. STOKES,
Secretary.

SCIENTIFIC BOOKS.

The Development of the Human Body, A Manual of Human Embryology. By J. PLAYFAIR McMURRICH. With two hundred and seventy illustrations. 12mo. Pp. xvi + 527.

The author in his preface describes his book as 'an attempt to present a concise statement of the development of the human body and a foundation for the proper understanding of the facts of anatomy.' This attempt has been so far successful that the volume is certainly the best short treatise on human embryology in English, and is not surpassed by any of the text-books in foreign languages. It has the distinguishing merit of including a number of important results from recent investigations, which have as yet made their way into no other manual.

The work is really shorter and more condensed than might be supposed from the number of pages, for the type used is large and open and the illustrations, owing to their large size, take up much space. Some of the figures, like Fig. 54, are unnecessarily large. They are, on the whole, well printed, although the ink used is too heavy to give the best effect. The selection of figures has been excellent. Except for a series of diagrams,

very few of them are original, by far the majority of the illustrations being copies, not, one is glad to note, from previous text-books, but from the best recent researches.

The author's style is well adapted to his purpose, for it is both concise and clear, revealing, indeed, a marked talent for lucid explanations of the complicated changes which occur in such rapid succession in the embryo, and which render the study of embryology so difficult.

The book would have certainly gained very much had it been less a compilation from well-chosen authorities, and more the outcome of the author's personal study of human embryos. As a compilation it is to be praised warmly, but one misses somehow that vividness of exposition which direct familiarity with preparations, sections and dissections alone can impart to morphological descriptions. One misses also the security of judgment which can be derived from first-hand and intimate acquaintance with the object. To this cause we attribute the author's failure to utilize at all adequately our knowledge of the histogenesis of the nervous system, to consider the relation of the nails to the stratum lucidum, to give any mention of the meninges which offer such striking pictures in sections of embryos, to remember that a mucous membrane always comprises epithelium and mesoderm (cf. p. 79), to describe correctly the degeneration of the glandular epithelium in the pregnant uterus (p. 151, 153), etc.

There are certain errors which mar the work. In the history of germ-cells it is stated positively that the germ-cells produce the spermatozoa, but so far as we know this has not been proved as yet by direct observation to be true of any animal. It is surely no longer correct to speak (p. 122) of the 'branchiomeres' as divisions of the ventral mesoderm, since they arise, so far as yet observed, always from the dorsal segments. It is stated (p. 153) that the decidua serotina 'loses its epithelium very early'—but portions of the epithelium are always persistent. Or again the statement that the processes of the vertebræ and ribs are developed in the intermuscular septa hardly concords with the actual history.