## SOCIETIES AND ACADEMIES.

### LONDON.

**Royal Society,** May 31.—"The Affinity Constants of Amphoteric Electrolytes." I. "Methyl Derivatives of Para-amino-benzoic Acid and of Glycine," by John **Johnston.** II. "Methyl Derivatives of Ortho- and Meta-amino-benzoic Acids," by A. C. **Cumming.** III. "Methylated Amino-acids," by James **Walker.**

The object of the present series of papers was to determine the influence of the substitution of the methyl group in $NH_2$ on the acidic and basic dissociation constants of amino-acids. The methods employed for the determination of the dissociation constants were for the most part hydrolytic, *i.e.* the degree of hydrolysis in aqueous solution of both types of salts of the amino-acids was estimated at given dilutions. For the basic constant methyl acetate catalysis, Löwenherz's solubility method and Farmer and Warth's distribution method were employed. In addition to these methods, the delicate diazo-acetic ester catalysis of Bredig and Fraenkel was used in a few instances. For the acidic constant, the electrical conductivity and Shields's saponification method were utilised.

Each substance investigated was subjected to careful purification, and many new methods were devised for the preparation of the methyl derivatives required. It may be noted that the monomethyl-meta-amino-benzoic acid described by Griess is a mixture of the monomethyl and dimethyl derivatives which it is practically impossible to separate by recrystallisation.

A comparison of the acidic and basic constants of the various substances examined showed that they were in general accordance with the following scheme. The primary influence of the substitution of methyl for hydrogen in the amino group is to raise the basic and diminish the acidic constant, the effect in both cases being, however, only slight. This primary influence is usually obscured by greater secondary influences due to stereochemical changes. These changes may exert their influence (1) by mere approximation of the active groups; (2) by change in degree of hydration of the basic group; (3) by ring-formation. In the case of ring-formation the acidic constant is diminished, speaking in general terms, proportionally to the extent to which the ring-formation has taken place. The basic constant, on the other hand, need not be so diminished, because the basic constant in the bodies investigated is principally a function of the hydration constant of the basic group, and the degree of hydration may not be diminished by increased ring-formation. A comparison of the basic constants of the amino-acids with those of their methyl esters affords information regarding the reciprocal stereochemical influence of the active groups. When there is little stereochemical influence the basic constant of the acid is nearly equal to that of the ester. When the stereochemical influence is marked the basic constant of the acid is much less than that of the ester. The following table of the constants of ortho-amino-benzoic acid and of para-amino-benzoic acid and their methyl derivatives may serve as illustrations. In the ortho series stereochemical influences are apparent, in the para series they are nearly absent.

#### Ortho Series.

| | $k_a \times 10^5$ | $k_b \times 10^{12}$ | Ester $k_b \times 10^{12}$ |
|---|---|---|---|
| Acid ... ... ... ... | 1·4 ... ... | 1·3 ... ... | 1·7 |
| Monomethyl ... ... | 0·46 ... ... | 0·9 ... ... | 33 |
| Dimethyl ... .. | 0·00023 ... | 0·28 ... ... | 60 |
| Betaine ... ... ... | 0·00000 ... | 0·28 ... ... | very great |

#### Para Series.

| | $k_a \times 10^5$ | $k_b \times 10^{12}$ | Ester $k_b \times 10^{12}$ |
|---|---|---|---|
| Acid ... ... ... ... | 1·2 ... ... | 2·5 ... ... | 2·4 |
| Monomethyl ... ... | 0·92 ... ... | 1·7 ... ... | 2·1 |
| Dimethyl ... ... ... | 0·94 ... ... | 3·2 ... ... | 3·3 |
| Betaine ... ... ... | 0·00000 ... | 32·3 ... ... | very great |

The great drop in the acidic constant of dimethyl-ortho-benzoic acid is due to ring-formation. In the case of the betaines the ring-formation must be nearly complete, as the acid constant has practically vanished. The basic constant of the betaines still assumes a comparatively high value, notwithstanding the extensive ring-formation, owing to the very high constant of the quaternary basic group, which cannot suffer dehydration except through ring-formation. The quaternary basic group of the betaine esters was proved to have basic properties comparable in strength with those of the caustic alkalies.

June 21.—"On the Distribution of Radium in the Earth's Crust." By the Hon. R. J. **Strutt,** F.R.S.

In a paper read before the society on April 5, the author gave determinations of the quantity of radium in igneous rocks. Similar data for sedimentary deposits will now be given to complete the survey of the radium content of the earth's crust.

The results for sedimentary rocks are given in Table I.

#### TABLE I.

| Rock | Locality | Radium per gram, in grams |
|---|---|---|
| Oolite ... ... ... | Bath ... ... ... ... ... | $5·84 \times 10^{-12}$ |
| Oolite ... ... ... | St. Alban's Head ... ... | $4·05 \times 10^{-12}$ |
| Marble .. ... ... | East Lothian ... ... .. | $3·87 \times 10^{-12}$ |
| Kimmeridge clay ... | Ely ... ... ... ... ... | $3·77 \times 10^{-12}$ |
| Oil-bearing sandstone | Galicia ... ... ... .. | $3·04 \times 10^{-12}$ |
| Roofing slate ... ... | Wales (?) ... ... ... ... | $2·57 \times 10^{-12}$ |
| Silicified gritty slate | St. Ives, Cornwall ... ... | $2·50 \times 10^{-12}$ |
| Gault clay ... ... | Cambridge ... ... ... | $2·13 \times 10^{-12}$ |
| Clay ... ... ... ... | Terling, Essex ... ... ... | $1·73 \times 10^{-12}$ |
| Red sandstone ... | East Lothian ... ... | $1·68 \times 10^{-12}$ |
| Gravel (fine siftings) | Terling, Essex ... ... ... | $1·42 \times 10^{-12}$ |
| Red chalk ... ... | Hunstanton ... ... ... | $1·07 \times 10^{-12}$ |
| Flint (large nodules) | Terling, Essex ... ... ... | $1·06 \times 10^{-12}$ |
| White marble .. ... | Deccan, India ... ... ... | $0·54 \times 10^{-12}$ |
| Marble ... ... ... | East Lothian ... ... ... | $0·52 \times 10^{-12}$ |
| Chalk ... ... ... | Bottom of pit, Cherry Hinton, Cambridgeshire | $0·78 \times 10^{-12}$ |
| Chalk[1] ... ... ... | Top of same pit ... ... | $0·25 \times 10^{-12}$ |

On comparing these figures with those given in the former paper for igneous rocks (Roy. Soc. Proc., vol. lxxvii., A, p. 479, last column but one of the table), it will be observed that the average radium content of sedimentary deposits does not differ appreciably from that of igneous rocks. This is what might be expected on the received view that sedimentary rocks derive their material from the disintegration of igneous ones.

The author has examined a number of specimens of rock-forming minerals for radium. The results are given in Table II. In some cases the quantity of material taken

#### TABLE II.

| Mineral | Locality where found | Quantity taken, grams | Radium per gram, in grams |
|---|---|---|---|
| Zircon ... ... | Ural Mountains | 1 | $865 \times 10^{-12}$ |
| Zircon .. ... | North Carolina | 1 | $658 \times 10^{-12}$ |
| Zircon ... ... | Brevig ... ... | 0·690 | $139 \times 10^{-12}$ |
| Zircon ... ... | Kimberley ... | 1·17 | $74·8 \times 10^{-12}$ |
| Perofskite ... | Magnet Cove, Arkansas .. | 1 | $197 \times 10^{-12}$ |
| Sphene ... ... | ? | 1 | $102 \times 10^{-12}$ |
| Apatite ... ... | Sweden ... .. | 8 | $29·7 \times 10^{-12}$ |
| Apatite ... ... | California ... .. | 4·7 | $11·0 \times 10^{-12}$ |
| Hornblende ... | ? | 7·5 | $4·27 \times 10^{-12}$ |
| Tourmaline ... | Devonshire ... | 11·3 | $3·32 \times 10^{-12}$ |
| Labradorite ... | Labrador ... ... | 17 | $1·1 \times 10^{-12}$? |
| White felspar ... | Nellore, India ... | 20 | $0·6 \times 10^{-12}$? |
| White mica .. | Nellore, India ... | 10 | $1·0 \times 10^{-12}$? |
| Brown mica ... | Deccan ... ... | 10 | $1·0 \times 10^{-12}$? |
| Brown mica ... | ? | 10 | Nil |
| White quartz ... | Nellore, India ... | 30 | Nil |
| Rutile ... ... | ? | 1 | Nil |
| Ilmenite ... ... | ? | 1 | Nil |

[1] This determination was made on 500 grams of material, in order to get a sufficient leak for measurement.

for the experiment proved insufficient to give a satisfactory quantitative measure of the amount of radium in the mineral. This is indicated by a note of interrogation. In other cases no radium at all was detected. In all probability some traces would have been found if more of the mineral had been taken, but the object was to determine whether the mineral made any important contribution to the total radium in the rock. Thus it was not thought worth while to push the examination of accessory minerals, such as ilmenite or rutile, which only occur in small proportions, very far. The quantities of material taken for these experiments are given, so that the quantitative significance of a negative result may be judged.

It will be observed that certain of the accessory minerals, *i.e.* zircon, sphene, perofskite, and apatite, which occur in granite, are rich in radium. The hornblende, micas, tourmaline, and felspars examined contain much less, while in quartz none could be detected.

PARIS.

**Academy of Sciences,** July 30.—M. H. Poincaré in the chair.—The observatory on Mt. Blanc: M. **Janssen.** An account of the improvements carried out at the observatory during the past year. At present MM. Millochau and Stefánik are carrying out spectroscopical researches, and the observatory will shortly be visited by MM. Guillemard and Moog for the continuation of biological work commenced last year, and by Alexis Hansky for the continuation of his work in astronomical physics.—The underlying principles of direct colour photography. The direct photography of colours based on prismatic dispersion: G. **Lippmann.** The single slit of a spectroscope is replaced by a series of slits very close together, formed of fine transparent lines, five to the millimetre. Full experimental details are given.—General remarks on interference photography in colours: G. **Lippmann.** The mercury mirror, theoretically, can be replaced by any other method of producing interference bands. Practically, the unavoidable defects of construction of the biprism or Fresnel double mirror would render the use of either of them inapplicable. The interference systems produced by half-silvered mirrors offer more chances of success.—The results obtained for the determination of two instrumental constants which occur in certain meridional observations: H. **Renan.** The application of the method described in a previous communication to the measurement of the angle between the crosswires of a meridian circle micrometer has shown that the mutual inclination of the wires is not absolutely constant, but is a function of the direction of the optic axis of the telescope. It is shown that this error, although small, can be eliminated by the author's method.—Observations of the Finlay comet (1906d) made with the bent equatorial of the Observatory of Lyons: J. **Guillaume.**—The area of Asiatic Russia and the method employed in its determination: J. **de Schokalsky.**—The combinations of ammonia with aurous chloride, bromide, and iodide: Fernand **Meyer.** The preparation and properties of the compounds $AuI.6NH_3$, $AuI.NH_3$, $AuBr.2NH_3$, $AuCl.12NH_3$ and $AuCl.3NH_3$ are described.—Some reactions of liquid chlorine: V. **Thomas** and P. **Dupuis.** A description of the reaction of liquid chlorine with iodine, bromine, sulphur, selenium, arsenic, antimony, bismuth, and gold. —The alloys of manganese and molybdenum: M. **Arrivant.** These alloys have been prepared in two ways, by heating a mixture of the two metals in the form of powder to 1500° C., and by the action of aluminium powder upon a mixture of the oxides $Mn_3O_4$ and $MoO_2$. A series of alloys containing from 12 per cent. to 30 per cent. of molybdenum was obtained, all of which were shown to consist of free manganese associated with either $Mn_6Mo$ or $Mn_4Mo$. Both the latter compounds were isolated.—The variations of electrical resistance of steels outside the regions of transformation: P. **Fournel.**—The estimation of ammonia in water by Nessler's reagent: Albert **Buisson.** The reaction between ammonia, potash, and mercuric iodide is a reversible one, and hence any estimation of ammonia based on the determination of mercury in the brown precipitate is inexact.—Synthetically prepared *l*-idite: Gabriel **Bertrand** and *A.* **Lanzenberg.** —Silver sulphide, selenide, and telluride: H. **Pélabon.**

Deductions from a study of the melting points of mixtures in varying proportions of silver and sulphur, silver and selenium, and silver and tellurium. The complete curve for the last named can be traced experimentally, and shows a eutectic melting at 345°, and $Ag_2Te$, melting at 955°.—The washing of colloidal precipitates: J. **Duclaux.** The author holds that the complete washing of a gelatinous precipitate is theoretically possible, and that in both gelatinous and colloidal precipitates there is no proportionality between the impurity removed at each washing and that remaining in the precipitate.—The true nature of the α-glucoproteins of M. Lepierre: J. **Galimard,** L. **Lacomme,** and A. **Morel.** The constitution attributed by M. Lepierre to the nitrogenous products employed by him for microbial cultures is inexact.—The amylase and maltase of the pancreatic juice: MM. **Bierry** and **Giaja.**—The mechanism of the valves of certain Acephaleæ during opening and closing, and its morphogenic consequences: F. **Marceau.**—A curative product derived from tuberculinine, a crystallised tuberculous poison: G. **Baudran.** Tuberculinine is a poisonous alkaloid extracted in the proportion of 0·06 per cent. to 0·10 per cent. from tubercle bacilli. This alkaloid, when oxidised under conditions specified with calcium permanganate, yields a substance possessing antitoxic power against the poison of the tubercle bacillus.—A tectonic sketch of France: E. **Jourdy.**

GÖTTINGEN.

**Royal Society of Sciences.**—The *Nachrichten* (physico-mathematical section), part ii. for 1906, contains the following memoirs communicated to the society:—

February 17.—Seismic records at Upsala (October, 1904–May, 1905): F. **Åkerblom.**

March 3.—Outlines of a general theory of linear integral equations (iv.): D. **Hilbert.**

May 12.—Characters of inorganic colloids (ultramicroscopic observations): W. **Blitz.**

The Business Notices (part i., 1906) include a report on the Samoa Observatory, and an obituary discourse on the late Baron Ferdinand von Richthofen.

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