Selected Papers.

On the Laws which Regulate the Division of a Body between two Solvents.*

BY MM. BERTHELOT AND JUNGFLEISCH.

It is frequently necessary to extract a body which has been dissolved in a liquid, by stirring into the latter another which does not combine with it, and whose action is, therefore, purely physical. Such means are frequently used for extraction, and even estimation, of bodies held in suspension in other liquids.

The action of the following bodies has been studied: Iodine and bromine, in the presence of water and of sulphide of carbon; succinic, malic, tartaric, oxalic, acetic, benzoic, sulphuric, and chlorhydric acids, in the presence of water and of ether.

All bodies capable of exercising chemical reaction were carefully excluded from our experiments; and the usual mode of operation was as follows: The body under treatment was dissolved in one liquid, a certain volume of another was then added; and the whole received a vigorous and prolonged stirring, the vessels being kept at one temperature by means of a water bath. The body in solution was estimated from time to time, until fixed results were obtained, which sometimes required one or two hours, and the amount was then estimated in each of the superincumbent liquids.

The Co-Efficient of Division.—A body simultaneously brought in contact with two solvents, in each of which it could be separately dissolved, never dissolves wholly in one to the exclusion of the other. Whatever may be the solubility of the body in question in one of these solvents, and whatever may be the excess of that solvent, the body is always divided between the two solvents.

Quantities dissolved by the same volume of two liquids remain in one constant relation between them. We will call this relation the co-efficient of division; it is independent of the relative volumes of the two solvents, but dependent on concentration and temperature. The following examples, cited from our numerous experiments, will be sufficient to establish this law:—

Succinic Acid, Water, and Ether at 15°.

	Final volume of the liquid.		Volume of barytawater saturating 10 c.c. of the liquid.		Co-efficient of division.
	Aqueous. c.c.	Ethereal. c.c.	Aqueous	Ethereal.	
Concentrated liquids.	70	30·0	42·44	7·1	6·0
	49	49·0	43·8	7·4	6·0
	28	55·5	47·4	7·9	6·0
More dilute liquids.	30	70·0	18·8	3·4	5·5
	17	17·0	16·2‡	3·0	5·4

The co-efficient of division of a body between two solvents is analogous to the co-efficient of division of a gas between a liquid, which will dissolve it, and an empty superposing space; but, in the latter case, it is the tension of gas in the unit of volume of the empty space, which determines the quantity dissolved in the entire volume of liquid. In the case of a body divided between two solvents, it is the final quantity dissolved in the unit of volume of one of these liquids, which determines the quantity dissolved in the unit of the other.

Influence of Temperature.—The co-efficient of division changes with the temperature, but very slowly.

	Weight of succinic acid contained in 10 c. c. of the liquid.		Co-efficient of Division.
At 15°	0·376	0·060	6·2
" 0°	0·376	0·078	4·9
" 15°	0·106	0·019	5·5
" 0°	0·098	0·019	5·0

Influence of Concentration.—The co-efficient of division varies with the final concentration of the solvents, but not in proportion to the weights dissolved; its progress is slower.

Experiments with malic, tartaric, and acetic acids demonstrate that the co-efficient varies more rapidly with the concentration when very soluble bodies are under treatment, than with those which are less so. This difference is explicable because concentrated solutions of tartaric or acetic acid dissolve ether in proportion, differing from those effected by diluted solutions.

Sulphuric acid and chlorhydric acids give rise to a remarkable analogy, ether will dissolve them only when they are concentrated. The proportion of acid obtained from their aqueous solutions which are slightly diluted, is almost inappreciable.

*From Comptes Rendus in Chemical News.
†Equivalent to 0·158 gr. of succinic acid.
‡Equivalent to 0·122 gr. of succinic acid.

On a Species of Ipomœa, affording Tampico Jalap.*

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(TRANSMITTED BY THE AUTHOR.)

Two centuries and a half have elapsed since Jalap, the tubercule of a convolvulaceous plant of Mexico, was introduced into the Materia Medica of Europe. The botanical origin of the drug long remained unsettled, evidence of which exists in the fact that two plants, neither of which yields jalap, have in succession received, and still retain, the specific name *Jalapa*. The veritable source of jalap, however, was brought to light between the years 1827 and 1830, in which latter the plant was described by Wenderoth as *Convolvulus Purga*. In 1833, it was figured by Hayne under the name of *Ipomœa Purga*; but in 1839, it was transferred, on account of its tubular corolla and exsert stamens, to Choisy's genus *Exogonium*. As this genus has been recently united to *Ipomœa* by Dr. Meisner, it appears best to return to the name proposed by Hayne, and to call the true jalap plant *Ipomœa Purga*.

The unsettled condition of Mexico, and the fluctuations of commerce, have alternately depreciated or enhanced the value of jalap, and have led to the occasional importation of other roots possessing more or less of the characters of the true drug. Of such kinds of jalap, one of the most remarkable is a tubercule imported a few years ago for the first time from Tampico, and thence called *Tampico Jalap*.† This drug has been extensively brought into the market (that is to say, by hundreds of bales); and though it is less rich in resin and less purgative than true jalap, yet on account of its lower price, it has found a ready sale, chiefly in continental trade.

As the botanical origin of this so-called Tampico Jalap, and even its place of growth, were completely unknown, I addressed a letter, in November, 1867, to my friend Hugo Finck, Esq., Prussian Vice-Consul at Cordova (Mexico), begging that he would, if possible, procure for me some information on the subject. Mr. Finck at first expressed strong doubts as to Tampico Jalap being anything else than the root of *Batatas Jalapa*, Chois., known in Mexico as *Purga macho*. Upon inquiry, however, he ascertained that such could not be the case, but that it is a production of the State of Guanajuato, where it grows along the Sierra Gorda, in the neighborhood of San Luis de la Paz. At this town, and in the adjacent villages, it is purchased of the Indians and carried by the muleteers to Tampico, where it is known as *Purga de Sierra Gorda*.

All attempts to procure specimens of the plant were for some time fruitless, chiefly owing to the difficulty of finding any one in the district who could be induced to take the needful trouble. The perseverance of Mr. Finck, and his friend Mr. E. Benecke, Consul General for Prussia in the city of Mexico, overcame at length this obstacle, but only to meet with others hardly less embarrassing. The first lot of specimens despatched from Guanajuato was stolen from the mail; the second shared the same fate; while a third, which included live tubercules, was, by successive detentions on the way, fully five months in reaching England. The box, however, came to hand in June last (1869); and, amid a mass of damp earth and decaying matter, I had the satisfaction of discovering one solitary tubercule exhibiting signs of vitality. This, placed in a greenhouse and carefully nursed, soon began to grow with rapidity, and, on removal to an open border, produced a tall and vigorous plant, which towards September showed signs of flowering. It was then taken up and replaced in the greenhouse, where it blossomed freely in October last, but did not mature any seeds. Accompanying the tubercules, but of course in a separate box, my correspondent sent some pressed and dried specimens from Guanajuato, which correspond perfectly with the growing plant.

Having ascertained from the study of these materials, that the plant belonged to the genus *Ipomœa*, I endeavored to identify it with some species described in the "Prodromus" of De Candolle, or in the subsequently published "Annales" of Walpers, but without success. Neither was I able to find any corresponding specimen in the herbaria of the British Museum or of the Royal Gardens of Kew. In the Paris Museum there is a plant, collected by Galeotti on the lofty Cordillera, near Oaxaca, which, so far as a scanty specimen enables me to judge, accords precisely with that received from Mr. Finck. It bears a number which is not mentioned in the enumeration, by Martens, of Galeotti's *Convolvulaceæ* (contained in the "Bulletin de l'Académie Royale de Bruxelles"); and, I therefore conclude that it is unnamed. Under these circumstances, I have drawn up the following diagnosis and description of the plant, which I propose to call *Ipomœa simulans*. The specific name is chosen in allusion to the re-

*Extracted from the Linnean Society's Journal, and published in the Pharmacist, Chicago.

† I cannot, at least, trace this jalap to have been offered in commerce as a distinct sort rather than about five or six years ago.