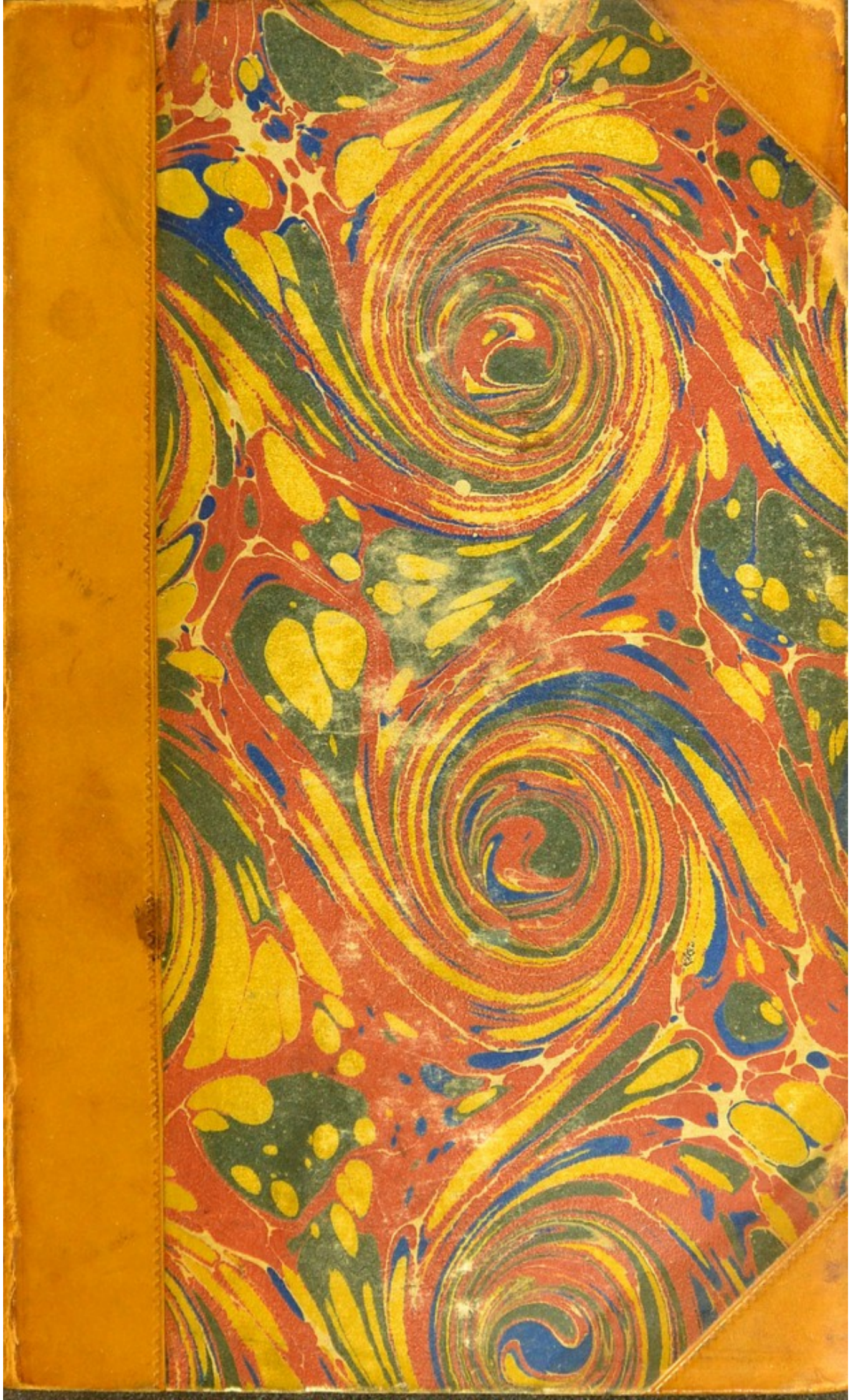
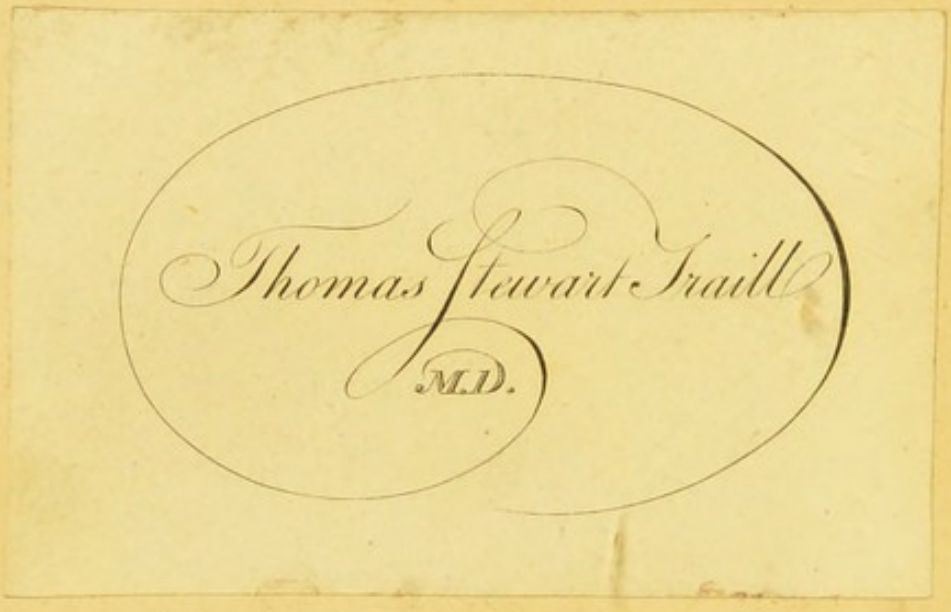
An experimental essay on the relative physiological and medicinal properties of iodine and its compounds : being the Harveian prize dissertation for 1837 / by Charles Cogswell.





Professor Traill
from the Author.

EXPERIMENTAL ESSAY

ON

IODINE AND ITS COMPOUNDS.

AN

EXPERIMENTAL ESSAY

ON THE RELATIVE

PHYSIOLOGICAL AND MEDICINAL PROPERTIES

OF

IODINE AND ITS COMPOUNDS;

BEING THE

HARVEIAN PRIZE DISSERTATION

FOR 1837.

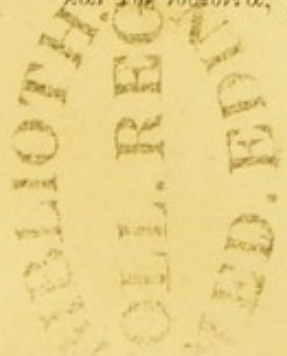
BY

CHARLES COGSWELL, A. B., M. D.

MEMBER OF THE ROYAL COLLEGE OF SURGEONS; EXTRAORDINARY MEMBER OF THE ROYAL MEDICAL SOCIETY OF EDINBURGH, &c.

δεῖ δὲ ἕ μᾶνον ἑωῦτὸν παρέχειν τὰ δέοντα ποιεῦντα, ἀλλὰ καὶ τὸν νοσέοντα, καὶ τὰς παρεόντας, καὶ τὰ ἔξωθεν.

HIPPOC. *Aphor.* I.



EDINBURGH:

ADAM & CHARLES BLACK, NORTH BRIDGE.

MDCCCXXXVII.

"We have also parks, and enclosures of all sorts of beasts and birds, which we use not onely for view or rareness, but likewise for dissections and tryals, that thereby we may take light what may be wrought upon the body of man. * * We try also all Poysons and other Medicines upon them, as well of Chirurgery, as of Physick."—BACON'S *New Atlantis.*

TO

THOMAS STEWART TRAILL, M.D., F.R.S.E.,

REGIUS PROFESSOR OF MEDICAL JURISPRUDENCE IN THE

UNIVERSITY OF EDINBURGH,

FELLOW OF THE ROYAL COLLEGE OF PHYSICIANS,

&c. &c. &c.

THIS ESSAY IS INSCRIBED,

IN TESTIMONY OF RESPECT FOR HIS SCIENTIFIC EMINENCE,

IN GRATITUDE FOR BENEFITS

DERIVED FROM HIS PUBLIC INSTRUCTIONS,

AND AS AN ACKNOWLEDGMENT, HOWEVER SLIGHT,

OF HIS UNIFORM KINDNESS,

BY

THE AUTHOR.

TO

THE HON. HENRY H. COGSWELL,

MEMBER OF HER MAJESTY'S COUNCIL FOR THE PROVINCE

OF NOVA SCOTIA.

SIR,—In laying before you these earliest fruits of a course of study carried on for many years at a distance from my family, I feel that whatever may be their comparative value, I can at least afford you some return for unwearied paternal bounties, by associating your name in this public manner with that of the distinguished Professor to whom, during my residence here, I have been so much indebted.

I am, Sir,

With the highest respect,

Your affectionate and grateful Son,

CHARLES COGSWELL.

CONTENTS.

CORRIGENDA.

Page 8, line 9 from the top, *for* c.iv. *read* civ.
18, line 14 from the top, *for* any increase from, *read* from any increase.
20, line 6 from the top, *for* popular, *read* papular.
67, line 4 from the bottom, *for* solution, *read* Iodine,

INTRODUCTION.

It is a remark of Dr Gregory, in his discourse on the duties of a physician, that there are more false facts, than false theories, in Science, at the time of making which, the author may be conceived to have had Therapeutics more particularly in his mind. If the great end of physical research be to work out principles, and incorporate them with laws of wider application, calculated to afford a commanding insight into the mutual relations of objects, that branch of natural knowledge which embraces the effects of medicines upon diseased structures, has hitherto made the least advances ; the cause, no doubt, being that necessity which prevents our insulating the phenomena, and analyzing them at leisure.*

* The physical causes which tend to render our medical investigations complicated and perplexed, should be carefully distinguished from that source of logical uncertainty, which prevents us in medicine from extending an inference from one individual to analogous cases, with the same degree of certainty as in the physical sciences. On this subject, my friend Mr Glover read a paper early in April to the Royal Medical Society, in which he succeeded, I

Reflections like these, are but too often suggested by the study of the medicinal history of Iodine. Notwithstanding the amount of genius, zeal, and assiduity, which have been devoted to the elucidation of its effects, an amount not exceeded in the instance of any article of the Materia Medica, for many of the chief practical men of the present day are referred to in the observation, we still remain very much in perplexity regarding its true character as a remedy. What renders the confusion more inextricable, is our finding the opposing testimonies on many points in dispute so nearly balanced, that we are often left without the resource of the superior judgment or information attributed to either side.

To furnish an illustration. A physician prescribing the *Tincture of iodine* in doses of 15 or 20 drops, finds his patients derive benefit, as well constitutionally, as in the disappearance of some chronic

think, in proving that Idiosyncrasy is the only *constant* source of uncertainty in our science, or, it may be, idiosyncrasy, added to the varying constitution of an individual at different times; and that physiological reasoning generally differs from the greater part of medical reasoning, inasmuch as in the former, for the most part, cognizance is taken of laws of action that are the same essentially in every individual; and that whenever medical reasoning allows of this fundamental admission, it is as secure in proceeding from one instance to another, as reasoning in physics. There will be found a paper on an allied subject, by the same gentleman, in Jameson's Journal for July in the present year.

local malady, and all without the ulterior supervention of bad effects. Another puts into practice the same system, as he supposes, but comes to the conclusion that it not unfrequently gives occasion to a train of ghastly and alarming consequences; and, nevertheless, far larger quantities in the hands of a third, are affirmed to have begotten no results of any kind. Still more striking is the case of *Hydriodate of potash*, drachms of which are freely administered by one practitioner, where the experience of a contemporary does not warrant him in exceeding the same number of grains.

At the present juncture, when empirical systems of more than common absurdity, are boldly asserting their claims to superiority over the results of steady and rational observation, it becomes especially important that no means should be left untried of reconciling such glaring discrepancies. A new method of making an inquiry has often the effect of eliciting truth with ease and simplicity, where long continued labours on a different path are not attended with success. It was doubtless from a conviction of this fact that the Harveian Society called attention to the particular line of investigation indicated by the title of this essay. When the writer had undertaken his task, the examination of opinions avowed

by authorities however eminent, become a matter, not exactly of inclination, but of duty. To those accustomed to similar researches, no better apology will seem requisite to justify him in subjecting the statements of his predecessors to the test of experimental analysis, whenever they shall wear the aspect of doubt, or appear somewhat contradictory.

It is far from being the author's meaning, that comparative experiment upon the lower animals, ought to be regarded as offering a *certain* index to the action of medicines; its evidence at the best is analogical, and, moreover, has often proved fallacious. But many of those circumstances, which, in the sick-chamber, tend invariably to produce confusion, are either absent, or may be brought more under control, so that the elements of uncertainty are at all events less numerous.

The varying nature of the conditions of the animal frame, is very far, however, from constituting the only obstacle, in the way of our attaining to the knowledge of truth in this investigation. Numerous considerations of a chemical nature demand attention likewise, as will be made to appear in the sequel.

We have recently had occasion, in witnessing the presence of Creozote pointed out in a series of heterogeneous substances, to admire that sagacity by which

our forefathers were led to apply these compositions to appropriate remedial, and other purposes, though ignorant as to what their usefulness depended upon.* In this early part of their history, Iodine and Creozote correspond remarkably with each other; for Iodine was introduced into medicine in an obscure dress, and sustained the ordeal of centuries of experience, before putting on the scientific aspect which it wears at present.

It is hard to conceive of any more convincing testimonials to the sterling worth of a remedy, than those which have been thus perseveringly, though unconsciously, handed down. Many individuals, while they seem to have half-despised the "*burnt sponge,*" as absurd and empirical, were yet forced to prescribe it by the ocular demonstration which they had of its efficacy. There were others, notwithstanding, who maintained against it an unyielding opposition, on the ground that they never had seen any of these asserted cures; nor, however paradoxical the remark may appear, have we now any just reason to call in question either the assiduity or the accuracy of their observation.

To explain:—It is known to pharmacologists, that Iodine found its way into medicine, in consequence of

* See, A Treatise on the Chemical, Medicinal, and Physiological Properties of Creozote; by John Rose Cormack. 1836.

an idea which, about the year 1820, suggested itself to Dr Coindet, that the ashes of the *Fucus vesiculosus*, long celebrated for the cure of bronchocele, might owe their specific virtues to the possession of this ingredient. The supposition very soon received ample verification from the successful trials that were made with Iodine ; * and since that time it has become equally apparent, that the corresponding powers of the *burnt sponge*, in which Dr Fyfe detected the same principle, arise from no other source.

Now, on looking back into the medicinal history of burnt sponge, we find that it was applied to the treatment of scrofula—a malady over which Iodine likewise possesses great control—at a very early date. † We may gather from Dioscorides ‡ and Pliny ‖ that they believed it beneficial in some af-

* Thus affording a splendid example of the reaction of pure science, upon the physical necessities of the human race.—*See Herschel's Discourse on the Study of Natural Philosophy.*

† It was as an external remedy that burnt sponge had its chief use among the ancients. Galen would have it applied hot, and even incandescent, for the arrestment of hæmorrhage (De Simp. Med. Fac. lib. ii.), and Dioscorides, Celsus, Oribasius (De Virt. Simp. Med.), taught a similar practice. Taken to the extent of three drachms, in severe uterine hæmorrhage, Galen regarded it as a most valuable resource. It is stated by Gmelin (Decouvertes des Russes) to be used in Russia as a vermifuge.

‡ Περὶ σπογγων, book v.

‖ I quote the principal passage from Pliny almost entire, as it affords a brief epitome of the uses of the burnt sponge, about the

fections of this class; Marcellus * also accords his testimony to its utility in purulent expectoration. The more definite statements of modern authors, however, give us really to understand, that burnt sponge is far from owing all its virtues to the imagination; an idea which the character of the early writings would be apt to inspire. It may suffice from among these to select the late distinguished Hufeland, in whose opinion no such powerful means existed for the dissipation of scrofulous tumours of the neck; in other glandular, and more particularly goitrous, enlargements, in catarrhal affections, and where the kidneys required to be stimulated, he had likewise proved its efficacy. †

It was in the thirteenth century, that Arnoldus de Villa Nova, as he was called, a celebrated physician and

first century:—"Africanæ (spongiæ) cinis, cum porri sectivi succo, sanguinem rejicientibus haustu salis ex frigida prodest. Idem cinis, vel cum oleo, vel aceto, fronti illitus tertianas tollit. Privatim Africanæ ex posca tumorem discutiunt. Omnium autem cinis, cum pice crematarum, sanguinem sistit vulnerum. Aliqui raras tantum ad hoc cum pice urunt. Et oculorum causa comburuntur in crudâ ollâ figulini operis, plurimum proficiente eo cinere contra scabritias genarum, excrescentesque carnes, et quicquid opus sit ibi destringere. spissare, explere."—(Nat. Hist. L. xxxi. c. 47).

* Spongiæ Africanæ exustæ cinis, cum succo porri sectivi haustus, empyicos sanat. (De Med. Emp. c. xvi.) The admirers of Laennec especially, will feel interested in the following quotation from the same author:—"Qui phthisi afficiuntur *maritima loca* vitare debent, atque illic maxime ubi *pix* conficitur, commorari."—*Ibid.*

† Traité de la Maladie Scrophuleuse, p. 255. 1821.

alchemist, born at Villeneuve in France, taught the use of the burnt sponge as a remedy for enlargements of the thyroid gland.* From that period, down to the era of Coindet's discovery, its name seems to have been associated with bronchocele, just as unerringly as we connect bark with intermittent fever at the present day. Odier (Man. de Med. Pratique), J. F. Martinet (Tr. de Mal. Chroniques, 1803), L. Valentin (Jour. Gen. de Med. c. iv.), are a few instances from the crowd of eminent men who have lauded it, as a discutient generally, but more particularly so in this species of tumour.†

Some writers, notwithstanding, considering themselves not justified by personal observation, in falling in with the general opinion, either omitted the remedy altogether in works of general pharmacology, (Alibert, Matière Med. 1817; Schwilgúe, Traité de Mat. Med. 1818,) or even went so far as to turn it into ridicule, (Chaumeton, Dict. des Sc. Med. xiii).

This discordance, it is submitted, may be account-

* Arnaldi Villanovani Praxis Medicinalis. Fol. Lugduni, 1586. Vide Practicæ Medicinæ, Lib. ii. p. 52. See Appendix, Letter A.

† There exists in the library of St Marks at Venice, a copy of Van Helmont, containing marginal annotations, said to be in the handwriting of Locke, among which is the following prescription for the cure of bronchocele: ℞ Spongiæ marinæ in carbonem ustæ uncias tres, &c.—Brera, *Saggio Clinico sull' Iodio.*

ed for even with honour to the discernment of both parties, by taking cognizance of the chemical properties of the Iodides of sodium and potassium, one of which constitutes the active ingredient of the *burnt sponge*, and of the pharmaceutic directions given by authority, for the preparation of the latter drug. These compounds are both *soluble* in water, and at a strong heat *volatile;* consequently, nothing was more likely than that the medicinal principle should constantly vary in proportion, at the very least, or even sometimes be altogether absent, according to the particular manipulations put in practice.

The hints to be gained from consulting works of a period antecedent to the knowledge of the powers of Iodine, seem to supply a singularly happy confirmation of the view just offered. Thus, the directions given, for example, by the Pharmacopœia Augustana Reformata (1672), the Russian (1797), and Danish (1805) Pharmacopœias, are exceedingly loose; the two last specified merely order sponge to be exposed to heat, in the same manner as for preparing common charcoal. What is still more to the point, the Genevese code of an early period, (the copy which I consulted is dated 1780), requires that the sponge should be previously well washed and dried before being burnt.

But, as if informed by experience of the insufficiency of the official details, some practitioners devised improvements of their own, the essential part of which consists in seizing the drug before it had undergone such extensive alterations. Herrenschwand, a Bernese physician, recommended a decoction of the unburned sponge; but Fodéré, alluding to this advice, says he approves most of mixing it up *in a semicalcined state* into a sort of lozenge with honey, which was to be allowed to dissolve slowly in the mouth.* It has been ascertained by Guibourt, that crude unwashed sponge, which has only been reduced by heat to a blackish brown-colour, like coffee, yields an ash which is richest in Iodine; although this principle is still apt to become dissipated by keeping.†

Thus it becomes apparent that while two individuals might suppose they were using the same remedy, one of them might experience unlimited success, while constant failures were the reward of the labours of his contemporary. A circumstance of which they were mutually ignorant lay at the bottom of the discrepancy.

The writer had other inducements for offering the

* Traité du Goitre et du Cretinisme, 8vo. 1800. Fifteen or twenty days, Fodéré states to have been the ordinary term of cure by this method.

† Jour. de Chim. Med. vii. 712.

above narrative, beyond its mere interest as a historical curiosity. While we thence derive the best assurance, that the virtues ascribed to the Iodide of potassium in certain affections, have their foundation in truth, it is well to know that here is likewise presented to us, the prototype of more than one important episode in the medicinal history of Iodine and its compounds.

There are two doctrines regarding the manner in which the agency of Iodine on the living body is affected by chemical union, which seem to divide the medical world at present. Some are of opinion, that Iodine and its compounds all follow essentially the same line of action, that is to say, that where Iodine is indicated, it is a matter of indifference which of these drugs is exhibited ;* while on the other side we find it maintained, that the compounds in question "combine the properties of the substance united to the Iodine, with those of this substance, and operate accordingly."†

As these theories cannot be both true together, the writer imagined, correctly or not, that the path intended for him to pursue was that of making original investigations, with a view of determining whether either, or which of them, had its foundation in

* Dictionnaire de Matiere Medicale. Art Iode.

† Thomson's Materia Medica. 2d Ed. p. 259.

nature. Unfortunately, he considers that his results do not distinctly warrant him in adopting the conclusion of either party. Others may possibly think differently ; but such as his observations are, he will endeavour to put them in such a clear light by proper arrangement, that any person may be easily enabled to form his own independent judgment upon them.

The title of the essay does not require that any notice should be taken of the *chemical* properties of the bodies to which it refers, and accordingly the writer will not enter at any length upon their consideration. But, as was hinted above, and the fact will only become too manifest in the subsequent pages, from the experience of all parties, himself included, without paying the most scrupulous attention to the chemical habitudes of Iodine, we shall constantly be liable to form erroneous or imperfect conclusions.

For these reasons, it has been thought advisable to premise every new department which is entered upon, with a connected view of the chemical properties of the substance concerned, such as shall include the points of most importance never to be left entirely out of memory.

The zeal of the profession has enriched our journals with many remarkable facts, calculated to throw

very considerable light, in the aggregate, both on the physiological and on the medicinal branch of the subject. Of these, the writer believes and trusts he has referred to the most important. Numerous, however, as they are, we are still only entitled to look upon them as a sort of nucleus, hereafter to be expanded, by repeated additions of similar materials, into a source of ample and accurate induction.

It is usual for authors to offer some apology for any inadvertencies into which they may have fallen. In complying with this proper custom, I may hope for that indulgence which should be accorded when omissions have arisen, neither from the want of care, nor of a due feeling of responsibility. Should a particular part of the investigation seem at any time to terminate somewhat abruptly, it will be recollected, that the sufficiency of an attempt ought to be estimated chiefly according to the degree in which it may answer the end proposed at setting out, and that no argument is defective, when the data laid down warrant the conclusion taken from them.*

* Circumstances, chiefly connected with the difficulty of procuring certain books for consultation, have occasioned a little delay in the publication. This, however, was perhaps fortunate, as I have thus had time to revise and confirm one or two of the leading experiments, and avail myself of the kind contributions of several friends, some of whom are of high professional standing.

IODINE.

THE chemical properties of Iodine were examined with much care by Gay-Lussac and Sir Humphrey Davy,* soon after its discovery by Courtois in 1812.†

Iodine fuses at 225° Fahr., and boils at 347°, evaporates, as is commonly stated, at ordinary temperatures, and sublimes readily with the vapour of water. Some observations made by the author, which bear reference to its evaporating point, will occur at a future page.

In the fused condition, Iodine is believed by Mr Kemp to conduct electricity.‡

* See Annales de Chimie, lxxxviii, xc, and xci.; and Phil. Trans. 1814 and 1815.

† The wide extent of diffusion in which Iodine now appears to exist throughout nature, magnifies its claims to every species of investigation. Davy detected it in six marine plants (Phil. Trans. 1814), and Dr Fyfe added the sponge (Ed. Phil. Jour.), since which it has been shewn to be present in several marine animals, in various European and American saline springs, (United States Dispensatory), in ores of silver and lead from Mexico, and by M. Mentzel in a zinc-ore from Upper Silesia (Feruss. Bull. 1828). Lastly, two phænogamous plants of the genera Salsola and Alöe, growing in the interior of America, have been found to contain iodine.

‡ Philos. Magazine, 1835, p. 441.

Iodine forms acids both with oxygen and hydrogen. Alcohol and ether dissolve it copiously. Thus, an ounce of alcohol, of specific gravity 840, will take up about forty grains of Iodine, constituting the tincture of the Dublin Pharmacopœia.* This preparation, it is of consequence to recollect, is very liable to undergo spontaneous changes. In less than forty-eight hours, an appreciable quantity of hydriodic acid is generated, which, before the lapse of a month, increases to a considerable amount; and, about this time, the fluid also manifests a trace of hydriodic ether.† Water precipitates Iodine from its alcoholic solution.

According to Gay-Lussac, water will dissolve a 7000th of its weight of Iodine;‡ but time is likewise apt to effect certain alterations in the aqueous solution, which have not yet been fully inquired into.§ Iodine is soluble in hydriodate of potash, to the same extent as it exists itself in this compound.

Many of the organic salifiable bases have been found to be acted on by Iodine, either uniting with it

* The *poids de marc* ounce, used in France and Geneva, will dissolve 48 grains of iodine, but itself consists of 560 grains. This circumstance has been a source of much confusion.

† Revue Medicale, iv. 347.

‡ Annales de Chimie, xci.

§ See Brewster's Journal, vol. viii.; also Appendix, Letter B.

directly, or undergoing decomposition.* With albumen this element forms a compound, very slightly soluble in alcohol, but insoluble in water ;† while, from its union with starch results a blue colour, which constitutes the most characteristic test of its presence.

It is stated by M. Devergie, in a recent work on Forensic Medicine, that, if the Tincture of Iodine be added in small quantities to wine, beer, and cider, it immediately gives rise to the production of iodic and hydriodic acids. I had noticed, that, after adding Iodine to the urine, it was only by following up with nitric or sulphuric acid, that the fluid could be made to strike a blue colour with boiled starch.

Of the different tests for Iodine, the substance just mentioned is allowed on all hands to be the best, as the blue colour afforded by their combination requires, according to Stromeyer, the presence of only a 450,000th part of free Iodine, in order to become visible. Should, however, the Iodine already exist in a state of combination, it must be rendered free, and this is usually accomplished by the addition of sulphuric acid, nitric acid, or chlorine, when the starch alone has not succeeded. But, if either the starch, or the decomposing agent, be too copious-

* *See* Pelletier, Annales de Chimie, Oct. 1836.

† O'Shaughnessy, Lancet, 1829–30, ii. 623.

ly made use of, the colour is liable to be again destroyed. By employing these means, I have been able to detect a grain of hydriodate of potash in 128 ounces of urine.

A modification of the above process was suggested by M. Baup, which he believes to be adequate to the detection of the millionth of a grain of Iodine. He suspends a slip of paper, moistened with the starch solution, a little distance above the fluid under trial, which should be contained in a stoppered bottle, and mixed with a small proportion of nitric acid. Besides its superior delicacy, this proceeding is thought to possess a great advantage, in not being likely to tinge the starch in any manner which might lead to an erroneous conclusion.*

From what has preceded, it will be apparent that there are many sources of error, which ought to be provided against as far as possible during the administration of Iodine. The spontaneously-formed inequalities in the constitution of the tincture, are alone sufficient to mislead the practitioner ; but the chances of fallacy are much increased by the ordinary custom of prescribing this preparation in an aqueous vehicle. As a consequence of its wide range of affinity, Iodine has also a long list of incompatibles, over and

* Berzelius, Traité de Chimie.

above which it has the misfortune of being subject to various adulterations. The articles employed for this fraud have been principally charcoal, plumbago, and the oxides of iron and manganese: further, I learn from Professor Christison, that he has detected no less a proportion than 15 per cent. of water,—too large an amount to have been the result of mere accident.*

The solid additions will be left exposed to view on portions of the specimen being submitted to evaporation, and to solution in alcohol; while, by subliming the Iodine through a known quantity of chloride of calcium, which will absorb the water, and retain the other impurities, and deducting any increase from the *total* weight of the solid sophistications previously traced in a similar portion of Iodine, we learn the quantity of water.

PHYSIOLOGICAL ACTION OF IODINE.

The manner in which iodine affects the surface of the human body is, in many respects, striking and peculiar. Irritation is here a distinctly marked feature in its action; and this, quite to a sufficient de-

* Dr O'Shaughnessy refers to a very ingenious adulteration of Iodine, which, however, he declines to make generally known, for fear of extending the fraud.—*Appendix to Lugol on Scrofula.*

gree, to suggest the propriety of considerable caution in its internal administration.

An evanescent yellowish-brown stain is the result of the momentary contact of iodine with the cuticle ; the consequences of its longer continued application, vary somewhat in different circumstances and individuals. The colour then deepens to a dark orange-brown, and sometimes remains permanently fixed, until the cuticle itself falls off.

There is commonly a good deal of smarting, and pricking pain, followed by a fit of itchiness, produced by the external employment of iodine ; and, in general, when these symptoms are very decided, the epidermis is sure to be detached. But this failed to be the case in two cases mentioned by M. Lugol, where the pain excited was particularly severe.* It has been remarked, that local diseases were brought to a more speedy and successful termination, in proportion to the certainty with which desquamation of the cuticle took place.† But that this event does not necessarily precede the cure, is perhaps indicated, among other reasons, by a case related by Mr Delisser, in which a scrofulous swelling of the knee-

* On the Effects of Iodine in Scrofulous Diseases, p. 17.

+ Buchanan, on a New Mode of Treatment for Diseased Joints, &c. 1828.

joint was removed at the end of a month, by topical friction with the tincture, as the author says nothing about it, and only mentions a sensation of smarting in some recent leech bites.*

Inunction with iodine has been known to occasion a popular eruption,† and authors have likewise observed vesication to proceed from repeated applications of the tincture.‡

The vapour of iodine having been inhaled by M. Chevalier, gave rise to violent colic pains ; M. Raspail, however, under the same circumstances, experienced nothing but a disagreeable impression on the posterior fauces.§ Some patients of M. Lugol, who breathed it incidentally while in the act of using the warm bath, became affected with headach and intoxication ; epistaxis likewise supervening in one instance.‖ Iodine vapour is, in the opinion of Dr Elliotson, far more irritating than chlorine to the pulmonary organs,—a quality which, in its medicinal capacity, requires it to be conjoined with narcotics.¶

The researches of Orfila give us to understand, that the presence of iodine in the cellular tissue, does

* Med. and Surg. Journ. xxi. 230. † Jour. Compl. xviii. 231.
‡ Medical Gazette, 1830. Buchanan, *loco cit.* p. 84.
§ Jour. Gen. de Med. c. iii.
‖ *Ut supra,* pp. 70, *et seq.* ¶ Lancet.

not injuriously affect the constitution of animals on which the experiment is tried. He introduced 72 grains of it into a wound in the back of a dog; in three days a yellowish-white crust was observed to have formed over the surface, the parts subjacent to which were red and inflamed. In six days, the animal appeared to be in tolerable health, (*"se portait a merveille."*)

Scarcely altogether satisfied with the descriptive character of Orfila's concluding expression, I thought it proper to repeat the experiment.

Experiment 1. I introduced a scruple of iodine into the cellular tissue of the thigh of an adult rabbit, through a small opening made in the skin. The animal manifested no symptom of pain, and was able to make use of the limb as freely as before the operation, but in the course of a fortnight it gradually lost flesh, exhibiting an emaciated look, while the hair dropped off from many parts of the head. At the end of this time, thick adhesive pus was found distending the cavity of the wound, whence the iodine had entirely disappeared. Here it was possible that the irritation of a large abscess, might have been the sole origin of the animal's unhealthy appearance; but whether it was actually so or

not, an experiment, against which so serious an objection might be urged, did not seem deserving of repetition, particularly as the larger the amount of iodine employed, it is obvious that this source of fallacy must progressively increase.

The physiological effects brought about by the internal administration of many substances, admit of a very convenient arrangement, founded upon their having arisen from large, or small and repeated doses. The same distribution has been extended to iodine,* and from the advantages in point of clearness and precision which it promises, it is the one we shall adopt on the present occasion.

I. *Of the Effects of Iodine in large doses.*

Magendie, the earliest physiological experimentalist upon iodine, relates that a drachm of the tincture thrown into t'e veins of animals produced no appreciable effect, and that solid iodine given to dogs merely induced a fit of vomiting.† He adds, that not only was he himself able to take a tea-spoonful of the tincture with impunity, but that he saw nearly an equal quantity prove harmless to a child. Dr Gully,

* Christison on Poisons. † Formulary of New Remedies.

likewise, the last translator of the celebrated "Formulary," adds, that he had gone as far as three drachms of the tincture daily, and could not observe any effect. In a case of obstinate *bronchocele*, Dr Kennedy of Glasgow exhibited, within eighty days, no less a quantity than 953 grains of iodine in the form of tincture; the doses having been so proportioned, that towards the last the patient used to take eighteen grains for the daily allowance. The health of the patient, a girl, did not seem to be in any way particularly affected.* Further, Mr Delisser alleges, that in two months time he gave 1019 grains of Iodine to a female labouring under cancer of the mamma, the doses at certain periods amounting to thirty grains every twenty-four hours. The consequences were anorexia, quick pulse, ulceration of the mouth, and fœtor of the breath, of a different kind, however, from that which arises *from mercury*, but ptyalism is not mentioned. The same writer informs us of a child three years old, that within a less space of time had 222 grains of Iodine given to it in the form of tincture. In the other instance, the drug was made into pills. An epileptic, who was treated by Dr

* Lond. Med. Repos. 1822. This appears to be the instance referred to by Dr Johnson in the Preface to his Translation of "Coindet on Iodine."

Franklin of Philadelphia, is said to have taken 300 drops of the tincture daily for a month, simply with the effect of improvement to the general health.*

To judge from what follows, we might conclude that insensibility to the action of Iodine is not limited to the human species; for I am informed by Mr Dick, the well known veterinary professor in this city, that a horse under his charge, to which iodine was given for three weeks, in very large doses, manifested no symptom which he could refer to its influence, except an unusual disregard for water. The average daily allowance was two drachms, administered in quantities ascending from a drachm up to two ounces.

The inference to which the facts we have just stated appear to lead, clashes singularly with the observations made by Orfila† and others. Six grains of iodine taken *on an empty stomach* affected this toxicologist with a sense of heat and constriction in the throat, nausea, eructations, and pain in the epigastrium, followed in ten minutes by slight vomiting. The pulse rose from 60 to 85 or 90, the respiratory

* Lancet, 1830.

† Toxicologie Generale, i. 556.

movements were performed with labour, and the temperature on the surface of the body was increased.

Moreover, dogs which were made to take iodine exhibited effects very analogous to the preceding, except in these being more aggravated, in consequence of the greater magnitude of the doses. From two to three drachms, in the solid state, quickly brought on violent vomiting, and where this was effectual the animals recovered, as took place with Magendie.* But when a ligature thrown round the gullet prevented the stomach from rejecting its contents, a state of depression was very quickly produced ; the animal would emit plaintive cries, the intestinal evacuations, if any appeared, were solid and scanty, and death gradually supervened in periods varying from two to seven days. One dog, which retained the poison without the necessity of a ligature, shewed a strong aversion for food.

In pursuance of the same view of the question, we may adduce some instances of bad effects from iodine, which occurred in the human subject. A patient of Dr Jahn swallowed, by mistake, a large quantity of the tincture of iodine, and was immediately seized

* Dr Manson had a patient who took by accident nearly an ounce of the tincture at once ; but being immediately vomited, it had no serious effect. Researches, &c. p. 59.

with violent pain in the belly, vomiting, abundant bloody diarrhœa, pallor, coldness, and tremors, anxiety, blueness below the eyes, perspiration on the forehead, and fulness of the pulse.* In the fourth volume of the *Journal de Chimie Medicale*, we find the history of a somewhat similar case. The individual in question, having taken two drachms and a half of the tincture of iodine, suffered immediately with a sense of heat and dryness in the throat, lancinating gastric pains, and fruitless efforts to vomit; in an hour the countenance assumed a wild expression, the pains became exceedingly intense, and there was a tendency exhibited to convulsive movements.

For the following interesting illustration of the effects of a large dose of iodine at a very early age, I am indebted to my friend Mr Samuel Wright of Nottingham, a gentleman whose residence within the sphere of Dr Manson's labours, has afforded him the most extensive opportunities of becoming familiar with the properties of iodine.

"In July 1835," he observes, "I was requested to visit an infant which had been given about three drachms of tincture of iodine, in mistake for Godfrey's cordial. The child was between two and three years of age, and when I saw it, it was lying in a supine position

* Journal Complementaire, xxxv. 60.

upon its mother's knee, in a state of tolerable composure, with the exception of an occasional turning of the head, and attempts to cough, which appeared to produce some pain. The pulse was much quickened, the child very thirsty, generally retching after each draught. Its lips were dyed yellow, there was much redness of the tongue and fauces, and an augmented secretion of frothy saliva. I immediately ordered an emetic, the operation of which was followed by an abatement of the symptoms, and a reduction of the pulse. It was given a small quantity of mucilage to drink, containing a little tinct. opii. The next morning there was very slight appearance of suffering; no ptyalism, but constipation, which was relieved by castor oil. A saline exhibition, with an occasional anodyne to calm the stomach, completed the cure in a few days."

If there are facts on one side, which seem to shew that iodine is devoid of energy, it certainly would not be easy to draw the same inference from those we have just mentioned, more particularly the uniform results of Orfila. The latter are likewise more in accordance with general experience. While examples of inertness, therefore, are comparatively rare, they constitute no rule, but must rather be regarded as exceptions to a general law; nor, in the

present instance, do the exceptions appear to be entirely inexplicable, by reference to the tendency of iodine to combine with various constituents of our common nutriment.*

It must at the same time be acknowledged, that the asserted harmlessness of iodine, when thrown into a vein, appears not easily reconcileable with the idea of its being otherwise very active. We must recollect, however, that a drachm of the tincture of iodine holds only five grains of this principle dissolved; it was this consideration among others, which impressed on the writer the propriety of trying the effect of a larger quantity of the solution.

Experiment 2.—Into the left jugular vein of a strong and lively terrier bitch, I injected two drachms

* "If the animal poisoned with iodine," Dr O'Shaughnessy remarks, "have recently eaten bread, potatoes, or other amylaceous substances, the iodine is almost immediately converted into the iodide of starch." And the observations of Dr Buchanan of Glasgow, seem to indicate that the iodide of starch is a very mild preparation. (See Med. Gaz. 1836.) Devergie considers starch an antidote to iodine. (Med. Legale.)

It has already been stated that iodine forms an insoluble compound with albumen.

Hence it appears not unlikely, that the operation of iodine will be materially modified by the use of food containing a large proportion of either starch or albumen. The ordinary nutriment of the horse comes under the former class. Beer and wine also will bring the iodine into a state of combination.

of recently prepared tincture of iodine, with an ivory syringe. The moment the instrument was emptied, a whining sound was emitted, accompanied by a universal convulsive start, the head was thrust forward with the mouth open, the chest laboured with noisy hurried respiration, and the heart's action became strong and tumultuous. After the lapse of a minute, there was another convulsive movement, the head came to a right angle with the trunk, and the tongue was thrust out of the mouth. In about two minutes, the heart's action, and the respiration, which had gradually become slow, and were now scarcely perceptible, were unexpectedly renewed with tolerable strength, but by degrees they became weaker again, until, in forty seconds, or about three minutes from the commencement of the operation, neither could be detected. All this time, the eyes were wide open, the pupils natural.

A minute after death, in laying open the cavity of the thorax, the pectoral muscles contracted with sufficient energy to move the corresponding extremities. The heart, which was much distended, utterly refused to contract, either when irritated with the scalpel, or when the great vessels were cut. There was little disposition, however, remaining in the blood to flow out, as apparently the great propor-

tion of it contained in the chest, had undergone coagulation.

We are not at liberty, strictly, to infer from this experiment, that iodine itself is a fatal poison when introduced into a vein, but simply, that the alcoholic solution of iodine thus administered, is not inert. Orfila killed a dog in a few seconds, by injecting four drachms of pure alcohol into the jugular vein, and found the blood, on dissection, separated into little coagula.

Experiment 3.—The same operation was repeated on a terrier bitch, but of less size and power than the preceding, the liquid being introduced with about twice the same degree of slowness. The animal raised its head and looked round for a second or two, then suffered it to drop, and preserved the prostrate position. It was quite unable to sustain itself on its legs. The heart's action became a short while sensible to the eye; in two minutes the animal began to draw deep and loud inspirations, which gradually became less distinct, until, after the farther lapse of two minutes, no signs of vitality remained. About a minute from the first, the animal voided a small quantity of urine.

Six minutes after death, the body was opened, when the muscles and heart were found to retain their irritability. The heart was filled with blood on both sides; that in the left cavity arterial, and nowhere did it appear coagulated, although on exposure to air it quickly solidified.

The next experiment was made to correspond with that of Magendie.

Experiment 4.—At half-past seven o'clock P. M., a drachm of tincture of iodine was very slowly introduced, with an ivory syringe, into the jugular vein of an active young bull-dog at the full growth. The animal made no struggle, but lay still, breathing naturally. In four minutes, the motion of the ribs began to quicken, and became sensible to the eye, and a sibilous rhonchus accompanied the respiration. For ten minutes he lay perfectly quiet, allowing his limbs to retain whatever position they were put into, but, at the same time, seeming to watch with his eyes the motions of those around him. The animal being now placed on his legs, was able, with much difficulty, to support himself, but in a short time succeeded in walking about, though preferring the recumbent posture. He refused to eat, having had

previously a voracious appetite. During the next day, the animal continued in a state of considerable depression, as indicated by unwillingness to move, or to take the smallest quantity of nourishment. On the third day he took his food, though without much eagerness ; and, with the exception of some languor and glassiness of the eyes, exhibited nothing unusual.

Of the post-mortem appearances produced in the human subject by the use of iodine, one account, which has proceeded from the pen of Dr Zink, refers to a female who died from the excessive use of the tincture.* He found the bowels inflated with gas ; in some parts of their tract highly inflamed ; in others exhibiting an approach to sphacelation, both within and without. The large and distended stomach, " etait comme marbre, par les taches, et la phlogose ;" and had an external abrasion, to the extent of two square inches. The inner membrane displayed redness, growing deeper from the cardiac towards the pyloric orifice, where the organ looked as if it had undergone corrosion. The mesentery was observed to be similarly spotted ; the liver large,

* Journal Comp. du Dict. des Sc. Med. xviii. 231.

and of a pale rose-red colour; the spleen covered with dark lenticular spots, penetrating to the depth of a line; the lungs pale, small, and spotted in like manner; the trachea and heart natural. Dr Jahn examined two fatal cases—in one, that of a female, death was preceded by enteritis, consequent on the use of the tincture; while the other subject, a male, had suffered from indulging too freely in the same solution for a cancer of the stomach. He notices the absence of fat, a faded and flabby state of all the organs, including the mucous glands of the intestines, the liver, spleen, and ovaries, and even atrophy of the cellular tissue.*

In such of the animals as died, in Orfila's experiments, he found the stomach internally yellow, and displaying patches of yellow mucus scattered over its lining membrane, as well as a number of little ulcers in the great *cul de sac;* but no morbid appearance, either in the intestines, or the other viscera. In one instance, the lower part of the œsophagus was yellow, and remarkably indurated.†

These last, however, were the effects of a very violent and rapid action of the poison. An experi-

* Jour. Compl. xxxv. 362.

† Iodine, when laid upon the dead intestine, in a short time communicates hardness and a thorough tinge of brown, both below, and for a line or two beyond it.

ment, to be detailed when we come upon the question of the accumulation of iodine in the system, gave me an opportunity of observing the effects of doses gradually increasing from a grain to sixteen grains a-day of solid iodine, administered for above a fortnight; the animal being killed, four days after the last exhibition, by Prussic acid. The viscera of the chest presented nothing abnormal except congestion of the lungs, probably attributable to the manner of death. The intestines, before being handled, had for their general aspect a diffused crimson-red tinge, an uncommon degree of contraction, in many places actual constriction, as if with a cord, and here and there a few bluish-grey oval spots. The stomach was of its usual dimensions, and nearly filled with the food last taken. Its lining membrane presented numerous small rugæ overspread, and having their interstices filled, with rather tenacious mucus, the sides and apices irregularly marked with dotted patches of crimson, or else brownish-red, vascularity. The lining membrane of the intestines, for about three feet from their origin, was remarkably vascular; oval spots, about the size of a chestnut, then began to occur at every three or four inches, on the side opposite to the mesentery; a similar spot at the junction with the colon was two or three inches in

length, and was expanded at its lower termination over the whole circuit of the gut. These spots were not injected, and were composed of little aggregated eminences with black points in the centre, separated from one another by white cellular bands. They appeared to consist of the agminated glands enlarged, as sometimes noticed in the early progress of fever. The colon was of a leaden colour, deepened at the longitudinal rugæ into black. No unnatural appearance could be traced in the other organs.

II. *Of the effects of Iodine in Small Doses.*

An association of medical men who devoted themselves, at the suggestion of Professor Joerg of Leipsic, to the highly philosophical end of ascertaining the effects of some of the more powerful drugs by experiments performed upon their own persons, made iodine one of the subjects of investigation. The following are the conclusions to which they have given publicity :—"The positive effect of the tincture of Iodine, consists in an excitement of the *whole alimentary canal.* With persons in health, there occur a saline taste in the mouth, an augmentation of the salivary secretion, increase of appetite, sensible motion of the bowels, slight pains, flatulent eva-

cuations. But this effect is transmitted also to the *brain*,—as is the case with all substances which considerably augment the action of the intestinal canal,—whence arise weight and heaviness of the head, occurring sometimes in one part, sometimes in another. Iodine has no less influence in augmenting the flow of blood towards the *lungs* and *trachea*, which it either rouses to a state bordering on inflammation, or actually inflames. The irritation seems to extend itself to the *nostrils*, where, as well as in the bowels, the secretion of mucus is much increased. As iodine acts so powerfully on the digestive tube, it should also, in a large dose, affect *the urinary organs*; many of the members decidedly experienced these secondary effects. Moreover, since iodine acts not only upon the surface of the intestines, but also on that of the parts which open into them, on the *glands* of the mouth and stomach, it should increase the *salivary, gastric, pancreatic, and biliary* secretions. It must therefore modify in a high degree the processes of *assimilation* and *nutrition* if properly employed. What physician would restrict the use of so powerful a remedy to bronchocele? Should we not expect the best effects from it, in diseases of the viscera, depending upon weakness and a congested state of these organs, in scrofula, and similar affections?

Its administration requires the greatest caution ; two, three, six, or eight drops will be the ordinary dose, repeated only every twenty-four or forty-eight hours, and taken each time in a little water." *

Of the above concise and systematic summary of the effects of iodine taken in moderate quantities, it will be satisfactory to inquire how it accords with general experience. We shall therefore adduce the observations of other authors illustrative of the above propositions, separately, and in the order followed by the German philosophers.

1. *Action of Iodine on the Alimentary Canal.*— Although Dr Coindet, at the time of making his first publication, expressed an opinion that Iodine acts neither on the bowels, kidneys, nor skin, yet he shortly found reason to disapprove of the tincture, on account of its baneful topical operation on the stomach. Dr Manson who used the tincture, occasionally found it to produce sickness at stomach ; † the same also occurred in several of M. Lugol's patients, but more than one-third of the latter experienced, moreover, a purgative effect. The favourite prescription of the French writer, was a largely di-

* Jour. de Prog. des Sc. Med. 1830. ii. 13.

† Researches on Iodine.

luted aqueous solution of iodine in hydriodate of potash; a circumstance that requires not to be lost sight of when we find M. Gendrin attributing a constipating influence to iodine,* and receive repeated injunctions from Dr Manson to keep the bowels open by aperients; the former gave iodine in the solid state, the latter in that of tincture. Some soldiers, treated with the tincture by M. Richond, occasionally suffered transient burning in the throat, sometimes tormina, headach, and redness and dryness of the tongue, all of which symptoms subsided on suspension of the remedy. †

A few well-marked instances of the unpleasant effects of iodine on the alimentary tube, have fallen under my own observation. One was that of a female, labouring slightly under ascites, and general œdema, who was ordered by a distinguished practitioner to take an ounce three times a day, of a solution of 20 grains of hydriodate of potash in 12 ounces of water, with the addition of an ounce and a-half of nitrous ether. On the third day she had several loose stools, with griping pain, consequent, as she declared, on the use of this medicine. It exhibited a reddish-brown colour, whereupon suspicion arose of some mistake, and it was desired to be renewed. Still, however, the

* Dict. de Mat. Med. † Arch. Gen. de Med. iv. 1824.

same signs of irritation ensued, and the mixture presented the objectionable colour. I found, on adding different specimens of nitrous ether to hydriodate of potash, that the iodine was liberated; the action, then, of free iodine on the digestive canal, seems to have been the cause of the disturbance.

Through the kind permission of two of the clinical professors, I was allowed, in some hospital cases where iodine was indicated, to regulate the preparations and doses, with reference to a particular inquiry; and several of my friends likewise obligingly consented to have a trial of it made upon their own persons. Of the individuals, eight in number, who took the *tincture of iodine* in water, in doses of fifteen drops, two experienced well-marked disorder of the first passages. One of these was a female, with enlarged liver, and deranged digestive functions, who had previously taken the iodide of iron without injury. The result of a single dose of the tincture is thus noticed in the Journal :—" Yesterday, some hours after taking fifteen drops of the tincture of iodine, was attacked with pain in the left iliac region, sickness, and distention,—relieved by a turpentine injection and cathartic draught. The pain has occasionally recurred, but is on the whole less, and relieved by pressure." A gentleman, who took three

doses in Sherry wine, each time experienced colic pain, (wine, as before stated, converts iodine into a compound); some days afterwards, on substituting water as the vehicle, he underwent, for the two or three following hours, frequent eructations, in which the taste of the iodine was perceived. The digestion in this instance was out of order. It thus appears that iodine, even in very small proportions, may make an immediate powerful impression on the alimentary tube; and this we have reason to believe referable here, rather to irritability depending on cognisable causes, than to idiosyncrasy, in the common acceptation of the term.

2. *Action on the Nervous System.*—Generally speaking, when iodine begins to disagree with a patient, one of the foremost among the bad symptoms is the sensation of giddiness, or headach, or perhaps of both united. One of Dr Manson's patients suffered so much from giddiness, in consequence of taking fifteen-drop doses of the tincture, as to be for two or three days confined to bed; another was rendered drowsy, and complained of feeling intoxicated; and, in a third, any quantity of the tincture above fifteen drops, was always productive of headach and drowsi-

ness. * Giddiness was likewise remarked by Dr Ashwell, in a female affected with a hard tumour of the uterus, to whom he was prescribing iodine, both topically and internally. † M. Lugol also in the performance of some experiments, found many individuals to become affected with stupor, and symptoms of intoxication, in consequence of accidentally inhaling iodine vapours. ‡

Great caution is enjoined in the use of iodine as a remedy, by Sir Benjamin Brodie, who asserts that it has been known to occasion *paralysis*. § Dr Manson has given strong testimony to its curative influence over this very disease ; and what assures us that these good effects probably arise from a peculiar excitement given to the nervous system, he takes notice that in one example the remedy brought on such troublesome convulsive movements, that the man asserted it was " like to twitch him out of bed," and petitioned for its discontinuance. An analogous example, but even more striking, is related by Sir Astley Cooper, where thirty drops of the tincture, in divided doses, gave rise to the most unpleasant convulsions, the hands and feet fell into incessant motion, and the patient declared that the whole night

* Researches, p. 61, &c.
† Guy's Hosp. Reports, i. 136.
‡ On Scrofula, p. 73.
§ Lancet, 1832.

long he resembled a person in the act of fighting or wrestling.* Mr Wright had a gentleman under his charge, to whom the same quantity was the cause of such marked intoxication, that he was obliged to resort to other treatment.

3. *Action on the Air-Passages.*—The whole tract of the air passages seems to be under the influence of iodine. Dr Manson records, that in one of his patients under treatment for ophthalmia by means of the tincture administered internally, the sense of smell returned after an absence of three years, which he supposes to have been owing to detumefaction of the Schneiderian membrane.

As regards the *lungs* more particularly, increased expectoration is specified by Dr Decarro as an effect of the tincture,† and from the account of Dr Rullman, hæmoptysis, and other thoracic disorders, would appear to have arisen from its employment, in Germany.‡ A female, mentioned in the *Journal Complementaire*, aged twenty-four, regular and not apparently phthisical, had a fatal attack of consumption brought on by two months' use of iodine; another patient was seized with cough and hæmoptysis after taking four or six drops of the tincture for some

* Lancet, 1823–4. ii. 147. † Jour. Univ. xvii.

‡ Lugol on Scrofula, p. 24.

weeks. M. Lugol may never, as he declares, have seen any of these accidents, but this was probably owing to his peculiar and cautious method of using the remedy. A later observer has witnessed bleeding from the nose and trachea, accompanied by vertigo, and irritability, resulting from the internal use of the tincture, and is therefore inclined to recommend entire restriction to the external method.*

4. *Action on the Salivary Glands.*—Whether iodine can give rise to salivation, is a question much in dispute; the decision will be of importance to those who follow Sydenham in believing, that (mercurial) ptyalism is the only cure for syphilis, "quicquid nonnulli, de aliis sanandi modis, satis temere et audacter effutiverint."†

Soreness of the mouth, and fœtid breath, are known to have been induced without the accompaniment of ptyalism; the former symptoms, at all events, are the only ones specified by M. Delisser, in his case formerly adverted to. In one of Dr Manson's patients the tincture gave rise to sore mouth and very considerable salivation.‡ M. Lugol's formula seemed to have had this effect in a remarkable degree; one

* Ashwell, Guy's Hosp. Rep. † Epist. de luc venerea.
‡ Researches, p. 61.

patient in particular suffered from profuse ptyalism. In the Medical Gazette for 1836, an instance of this phenomenon, occurring during the exhibition of Iodine, is alluded to by Mr Winslow (p. 401). This is followed by another of Dr Ely (p. 480) ; the event ensuing after forty-five drops of Coindet's tincture had been taken for five weeks, although mercury given four months previously (but meanwhile entirely omitted) did not effect the mouth, (p. 671). In a case of enlarged spleen, for which eight drops of the tincture, thrice daily, was ordered by Dr Mackall of Maryland, sore mouth and profuse ptyalism, accompanied by "*mercurial*" fœtor, supervened after the twelfth or fifteenth dose, salivation having been induced two months before by mercury.* Dr Miguel relates a case of iodism, one of the symptoms of which was constant spitting "amounting to salivation."†

An augmented flow of saliva frequently fell under Mr Wright's observation, but he never met with a case of genuine ptyalism, that is, unattended with an increase of the other secretions. I remarked that a dog under the influence of iodine was affected with a dropping of the saliva, but the urinary and fœcal evacuations also suffered an increase.

* Med. Chir. Rev. Jan. 1836. † Med. Chir. Rev. ii. 1825.

But iodine has also shewn itself remarkably influential in *checking* salivation, Professor Hufeland having seventeen times subdued this factitious malady by giving two grains of iodine daily.*

Even the latter statement does not violently oppose the notion of iodine having power to produce salivation ; it certainly tends to shew that this drug has a particular action, of whatever kind, on the salivary glands.

It is singular, that in most of the above examples of ptyalism, mercury is stated to have been given on a former occasion, and possibly the same might have been the case with all. Hence some have referred the effect to the simple *development* of the mercurial action by the iodine. May it not be, that the salivary glands, rendered susceptible by the mercury,—in the same way that an organ once inflamed is afterwards more liable to renewed attacks,—respond to the irritation of iodine, by effects which, without this preliminary, might have been brought about with difficulty, or not at all ?

There is no *absurdity* in conceiving that iodine may salivate, a thing which chlorine,† digitalis, and several other substances, are able to accomplish. Dr

* Med. Chir. Rev. xx.

† *See* Wallace's "Researches, respecting the Medical powers of Chlorine." 1822.

Johnson says, he himself has seen arsenic produce this effect.*

5. *Action on the Liver and Spleen*—The redness of the one, and ecchymosis of the other of these organs, in Dr Zink's case above cited, give some countenance to the idea that iodine has a primary or specific tendency to act upon them. In fact, from this case, and another where pain occurred in the hepatic region, and the liver was found enlarged after death, Dr Christison is of opinion that iodine possesses the power of inflaming the latter organ.† Various therapeutic facts conduct to a similar conclusion.

6. *Action on the Generative System.*—Dr Manson states, that he rarely observed the tincture to influence physiologically the uterine functions, but at page 59 of his "Researches," an instance occurs where the menses ceased for some time. Two females, mentioned by Dr Rivers of America, became barren, though young and previously prolific.‡ Magendie, again, in seeking an emmenagogue effect from the medicine, in a young lady of unsuspected virtue, brought on an abortion.§

* Med. Chir. Rev. Jan. 1836. † Treatise on Poisons.
‡ Amer. Jour. of Med. Sc. viii. § "Formulary," by Gully, p. 105.

But the most celebrated result attributed to the use of iodine is, the production of atrophy of the mammæ and testicles, of which there are some well attested cases upon record. One of these is that of a woman, referred to in Rust's Journal, who lost her breasts after a four months' trial of the remedy for a goitre, although the disease continued stationary.* Three well known examples are also reported in Hufeland's Journal.† Professor Traill has likewise made known to me an instance that occurred in Britain, where both the mammæ and a goitrous tumour underwent simultaneous atrophy. The account of a male subject is given in the Lancet, whose genital organs degenerated and wasted, while he was under treatment for bronchocele.‡

Such histories, however, are far from common. For proof of this, Mr Pereira says, he has seen iodine exhibited hundreds of times with no such unhappy event,§ and to the same purport are the remarks of Magendie and other writers. It seems that a statement of Dr Coindet has been extended and falsely generalized, until an exceedingly rare accident came to be looked upon as what ought only to be expected.‖

* Christison, p. 180. † Feruss. Bull. iv. 177.

‡ Lancet, 1828-9. § Med. Gaz. xvii.

‖ Dict. de Mat. Med.—If confidence be due to one of the too often fanciful 'placita of the ancient physicians, Iodine is scarcely a match

An aphrodisiac effect has been ascribed to iodine, but apparently not upon very extensive grounds. Dr Kolley experienced no such excitement in his own person, nor, in a wide sphere of observation was he ever led to infer its existence.*

7. *Action on the Kidneys.*—Dr Coindet was disposed to consider iodine free from diuretic action, and the silence of Dr Manson on the subject, might lead us to imagine, that he also did not observe any remarkable augmentation of the urinary secretion. Lugol, on the contrary, styles iodine a powerful diuretic, as he understood that all his patients taking it were subject to copious micturition. Could this difference have arisen from the want of correspondence between the tincture, and M. Lugol's iodurretted mineral wa-

for Hemlock, in its hostility to the sexual organs. Marcellus says, 'Ut eunuchum sine ferro facias, radices cicutæ ex aceto teres, et inde testiculos spisissime inlines, tum linteolum supra ligabis, ne excidat medicamen.' The younger the child the more certain. (*De Med. Empir.* Exp. 33.) The root of *Nymphœa* or *Clava Herculis,* bruised and given to a boy for ten days in vinegar, will emasculate him 'mirandum in modum.' (*Ibid.*) Several of the French soldiers, on the return from Egypt, lost the testicles, which Larrey ascribes to the use, in a hot country, of date brandy seasoned with different products of the Solaneæ. (*Mem. de Chir. Mil.* ii. 64.) This is curious, as the Love-apple (*Solanum Lycopersicum*) a member of the same vegetable family, is considered no feeble aphrodisiac.

* Jour. Compl. xvii.

ter ?* Professor A. T. Thomson includes iodine among his class of diuretics.

8. *Action on the Skin.*—With individuals who have suffered debility and emaciation from the use of iodine, it is common to experience profuse sweats, though this consequence is perhaps only a necessary attendant upon the general prostration. But effects upon the skin have been observed of a more specific character, one of which is, a dingy appearance of the surface. This incident is narrated by Dr Vogel, in the fourteenth volume of Rust's Magazine, as happening to a female, whose exterior, after a few days, looked as if it had been smoked. Mr Stedman having noticed that, on one occasion, iodine produced glossiness of the hair, and freedom of the scalp from scales, found, on more extended observation, this result to be not unfrequent.

I understand, from Mr Wright, that he has repeatedly seen iodine give rise to erythema and a pustular eruption when administered internally,—the former always connected with an irritable state of the bowels, while the pustules were rather a salu-

* This author, at page 146. relates the incident of diarrhœa and copious micturition alternating with each other, in the case which he there describes.

tary sign, indicating that the remedy was acting beneficially. The circumstance which first taught him to regard this eruption in a favourable light was, the assertion of a patient labouring under incipient cancer, that on its breaking out, the pain and other symptoms abated. On the substitution of a fresh specimen of iodine, the pustules subsided, with a return of the old symptoms; but a purer sample restored the cutaneous affection, and simultaneously relieved the sufferer. An old scrofulous subject mentioned by Dr Henning, who was taking the tincture for his complaint, underwent a critical sweating of several days' duration.* I may add, that a tendency to perspire more than usual was the sole change that one of my friends thought he could ascribe to the tincture, while taking it for the purpose of experiment.

9. *Action on the Nutritive System.*—The exact features and extent of the influence which iodine exercises upon the nutrition of the different organs, constitutes a "quæstio vexata," the origin of which is perhaps owing to a variety of causes. Though a powerful agent, it usually acquires its sway by slow and obscure approaches, not like arsenic or strych-

* Revue Med. Mars, 1834.

nine, which cannot be pushed beyond a small and limited dose, without at once reminding the practitioner that he is working with edged tools; and, if we take into account the adulterations of iodine, with its liability to chemical changes, so remarkable, that even most articles of ordinary nutriment may often be suspected of modifying its action, there is less trouble in conceiving why it should be the subject of extraordinary discrepancies. An alteration of diet, or the substitution of beer or wine for water as the vehicle, however little adverted to, might vary its effects in an odd, and seemingly unaccountable manner. Is it inconsistent with the laws of Therapeutics, do we not rather learn from universal observation, that the very substance which, in moderation, exerts a bland and wholesome influence, may, when pushed beyond due bounds, proceed to injury and destruction?

After a period, very inconstant in individual cases, but which generally does not arrive, with proper care, at least for some days, iodine is apt to occasion various unpleasant feelings, such as nausea, headach, and general uneasiness, which, if neglected, prove only the forerunners of a rapid and melancholy train of accidents, designated by Coindet *Iodic Symptoms*. Among these, Dr Zink has enumerated accelerated pulse, palpitation, a clammy state of the

mouth, ardent thirst, violent and sustained erections, diarrhœa, tremors, emaciation, and death, as those seen by himself in one instance.* Dr Jahn lays down as the characters of *iodism*, melting of the fat, a foul viscid state of the skin, augmented seminal and menstrual secretion, irritability, depraved digestion, fluidity of the blood, frequent yellow stools, a pellicular formation on the urine.†

That iodine, when incautiously administered, is endowed with sufficient energy to produce the above train of symptoms, cannot easily be questioned; while, at the same time, these proofs of its power when abused, far from countervail the reality of its possessing wholesome properties, or there is no truth in the adage, "Nihil prodest quod non potest lædere idem."

Before iodine had got into use beyond his own sphere, Dr Coindet characterised it as a "tonic, giving tone and exciting appetite;" and Dr Manson, whose extended researches furnished a very wide basis of induction, states that the tincture had generally a cordial and tonic effect, unless given in too large quantities, his patients commonly finding them-

* Journ. Compl. xviii.

† Ibid. xxxv. Dr Gairdner also, in his interesting memoir, goes at great length into the history of iodism.

selves in better health and spirits than they had previously enjoyed for years. Whatever degree of wonder, then, M. Lugol's cures may inspire, there ought to be nothing incredible in his assertion, that iodine gave rise to *embonpoint*, particularly when we recollect the circumstances under which he acted. Engaged in inquiries, the issue of which might materially bear upon his reputation, he was likely to watch the diet, exercise, and clothing of his patients with minute attention, points which, in ordinary practice, it is almost impossible to regulate. With precautions like these, and the assistance of an acknowledged stimulant and tonic, the cases would indeed be desperate which we might not promise to improve.*

Some have conceived the whole physiological character of iodine to be expressed by the definition of "a stimulant to the absorbent system." But that something farther requires to be included, is more than

* The iodine mania that went abroad soon after Coindet's discovery was announced, giving rise to events of lasting detriment to its medicinal credit, is perhaps unprecedented in the annals of Therapeutics. Dr Zink says, with reference to iodine at this time, "Il fut poussé si loin que je pourrais dire sans trop d'exaggeration que le flaçon de teinture se portait en place de bonbonniere, car j'ái vu des personnes se porter avec elles ; a peu d'exceptions pres, chacun en usait, même ceux qui craignaient que le goitre put leur venir dans la suite."—*Journ. Comp.* xviii. 231.

probable, otherwise, in certain cases, there is no very obvious mode of explaining its action. For instance, this remedy has been found remarkably influential in putting a check upon the ulcerative process, so that in the same patient, and on the same limb, the arrest of a spreading cachectic ulcer may accompany the absorption of a node. "Here are two actions of a remedy," Mr Key remarks, "opposed to each other, and inexplicable, so long as ulceration is regarded in the mere light of absorption;" and this eminent surgeon is inclined to ascribe the result to some modifying influence exercised over the nervous or vital action of the diseased surface.*

Is Iodine a Cumulative Medicine?

The symptoms occurring at the commencement of iodism having been thought to bear a mildness and obscurity, hardly commensurate with the apparently accumulated violence of their development after proceeding a certain length, Dr Coindet was led to look upon iodine as a remedy which tends to *saturate* the economy before displaying its action. A similar view has been adopted by several men of the first professional rank; while others, not less distinguished, attribute the iodic phenomena to progressive irrita-

* Med. Chir. Trans. xix. 144.

tion of the stomach, at length arrived at its acmé, and conveyed sympathetically to other organs or systems of organs.

Among the latter class, M. Matthey finds it hard to imagine, how twelve grains of iodine, for instance, distributed in divided doses through several days, can suffice to saturate the human solids and fluids. But, while vomiting, hiccough, thorough prostration, and rapid death, spring from acute inflammation of the stomach, so he conceives are sustained appetite, dry cough, gastric pain and emaciation, equally significant of its slower and more insidious irritation.*

But it does not require so much as twelve grains to establish, at all events, the primary stage of iodism, if by this term we be allowed to designate those annoying symptoms which the smallest dose of iodine is liable to occasion in some individuals. An hysterical female, of whom Dr Kolley gives an account, could not even take three or four drops of the tincture without suffering anxiety, tremors, cold sweating, desire to vomit, and irritability.† Other examples of the same tendency were noticed at page 39. We can scarcely hesitate to suppose, that a continuance of the remedy would produce confirmed

* Bibliot. Univ. Sc. et Arts, xvii. 75. † Jour. Univ. xvii. 311.

iodism in individuals thus constituted, with greater facility than where the sensibility to its action is less striking, and takes long to shew itself; granting which, it is obvious that *saturation* of the system does not necessarily precede iodism.

It may likewise be noted, that, according to universal agreement, the progress of iodism, unless already far advanced, is soon checked by discontinuing the remedy, which certainly does not favour the idea of its remaining physically in contact with the tissues.

Nevertheless, from the following researches, it is not exactly clear how far this inference is likely to be borne out by further observation. A mode of examining the question experimentally, suggested itself, which, though surrounded with sources of fallacy, has afforded results at least curious, and, if it has led to no decided inference, so far important, as shewing the inquiry to be more involved than it appears on a cursory inspection. I allude to the examination of the urine of individuals who have been taking the different preparations of iodine; as it occurred that the space of time within which this substance appeared in the urine, would indicate in some measure the rapidity of its absorption, while the period of its disappearance from the secretion might shew, on the

other hand, how soon it had all passed out of the system. The chief objections are, that the iodine *may* remain fixed in the tissues without tending to make its exit by the kidneys, although, for a substance possessing its tendency to form soluble combinations, this does not carry very much weight; and that it may be discharged through the bowels.

The experiment was tried upon eleven individuals in all, the greater number of whom were young gentlemen, who very obligingly submitted to become the passive subjects of an inquiry in which they had no immediate interest; the others were patients in the Infirmary, to whose maladies the remedy was suited.

The dose of tincture of iodine usually given was fifteen drops, containing about a grain of iodine; and water, designedly in compliance with custom, was employed as the vehicle.

1. A man with a chronic papular eruption, took the tincture thrice daily for five days, when he left the hospital. The urine was tested every day about four hours after the morning dose. Iodine not detected.

2. A man with diseased liver took four grains of hydriodate of potash, three hours after which the

iodine appeared in the urine,* and the medicine was stopped. In twenty-four hours iodine could not be detected.

The same patient took the *tincture* three times a-day for six days, before the iodine made its appearance. The hydriodate of potash was resumed on the sixth day following, and was found in the secretion four hours after a single dose of one grain.

3. A gentleman. Iodine found four hours after the first dose of the tincture. He continued taking it thrice daily for five days; on the third and fourth it disappeared, but on the fifth it again became visible.

4. A gentleman. Took the tincture at the rate of thrice daily for forty-eight hours. About four hours after the last dose, iodine was detected.

5. A gentleman. No iodine in the urine five hours after a dose of the tincture. I did not see him again for five days, during which he took about twenty drops a-day. The iodine was then present.

6. A gentleman. Took three doses in one day, by mistake, in Sherry wine. Iodine apparent in the urine passed shortly after each dose. On omitting

* Combined iodine is meant to be understood on all of these occasions.

the tincture there was none detected on the following day. The same gentleman about a week after took fifteen drops in water, having his bladder empty at the time. In the urine passed at three hours, no iodine ; at five hours it began to appear ; at seven hours strongly characteristic ; at eighteen hours absent.

7. A gentleman. Tincture twice daily for three days. About four hours after the fifth dose iodine detected. It was now omitted, and the day following none existed in the urine.

The next experiments were with the iodide of iron, in solution.

8. A patient with liver complaint and irritable bowels. Took a grain thrice daily. Detected four hours after last dose.

9. A man labouring under secondary syphilis. Took a grain of the iodide. Iodine found in the urine passed three hours afterwards.

10. A gentleman. Took a third of a grain *bis die*. Iodine detected four or five hours after the third dose.

11. A gentleman. Took a grain in the afternoon. Iodine not found early the next morning, but characteristic at noon. (This individual complained of

heat and thirst in the interval, from the effect of a rich supper.)*

It was also resolved to try, whether iodine would remain in contact with the textures for any lengthened period of time.

Experiment 5.—A young setter-dog commenced with taking half a grain of iodine twice daily, in the form of pill. The dose was gradually raised, and by the fourth day amounted to a grain and a half, when the animal began to betray a much sharper appetite, suffer the saliva to drop involuntarily, and void the urine and fœces in greater abundance. On the ninth day his daily allowance of iodine had risen to four grains, which quantity lastly was quadrupled by the seventeenth day, when (seventy-three grains having been taken in all) the drug was discontinued. On

* The test employed was starch, followed by sulphuric acid, which last is the most delicate agent I have employed in the liberation of iodine. In two or three instances it developed the colour instantly, where nitric acid required much longer to act, and the same I have known happen in the hands of a well known chemist. *Causa latet.* We should beware of being misled by the purple tinge which both of these acids possess the power of imparting to the urine.

It is proper to mention, that Dr Clendinning says he has detected iodine in this fluid twenty minutes after the first, and eighty hours after the last dose (of hydriodate of potash?) was administered.

the day succeeding the last exhibition, the animal scarcely retained any power of locomotion, and in the act of walking, or rather crawling, kept one of the hind feet constantly uplifted. He took little food, and what he did take was with little apparent appetite. In a couple of days, however, he began to revive and walk with less difficulty ; and by the lapse of five days from the cessation of the iodine, when the symptoms arising from it were much abated, he was destroyed by means of prussic acid.

About the middle of the experiment some of the urine was collected, and found to contain iodine in the combined form to a highly appreciable extent.

During the whole period no vegetable aliment was allowed to be given.

The brain, the spinal cord, the stomach, the muscles of the thighs and the blood were examined respectively, for the presence of iodine, by digesting each substance, in a state of fine division, in water which contained a little aqua potassæ, pouring off and evaporating the opaque liquor, and igniting the residue in a platinum capsule ; after which the ash was boiled in water, and this fluid treated with starch and sulphuric acid. The blood, with the brain and stomach, thus presented a trace, and but a trace of

iodine ; none, however, was discovered in either the spinal marrow or the muscles.*

Complicated and troublesome beyond my expectation, as this enquiry has turned out,† I think we can deduce from the above results, that iodine taken, as it has been usually prescribed, in the form of tincture mixed with water, becomes less readily absorbed, and probably remains longer in the bowels, than in the other forms already mentioned.

Sometimes the *iodine* made a quick passage to the kidneys, but in the greater number of cases its appearance in their secretion was exceedingly tardy, unless indeed it made its escape in the intervals of testing the urine, which does not appear probable. It even varied in the same individual at different periods, appearing, departing, and reappearing, without any evident cause.

* The above experiment is obviously not calculated to indicate the exact amount of iodine contained in the tissues, on account of the application of heat during the analysis. It may afford a hint for the guidance of future inquiry.

An account of the appearances upon dissection was given at page 34.

† None the less that one who professes to "cast the nativity of urinals, and try diseases like a witch by water," has certain prejudices to surmount, which, it is to be hoped, will soon fall before the growing importance of this source of information.

The same was not the case with the iodide of potassium, and perhaps of iron ; the former is even noted for passing rapidly out of the system.

The experiment on the dog speaks rather in favour of the cumulative doctrine, but, on the other hand, we must observe that some portion of the iodine did flow off in the excretion, and that the large amount taken latterly might give employment to the kidneys for some time before being altogether withdrawn from the different tissues.

MEDICINAL PROPERTIES OF IODINE.

The number of distinct physiological actions which iodine has just been shewn to be capable of putting forth, however this may be accounted for,—and we leave the inquiry as one replete with interest to the more ingenious and speculative reader, —tends at least to throw an air of greater credibility over the diversified histories of cures said to have been accomplished by this remedy.

In pursuing the present branch of the subject, it is difficult to adopt any arrangement that shall conduct by a natural gradation from one topic to the succeeding one. Convenience, then, must constitute

the guide ; accordingly, after premising some remarks on the different modes of administering iodine, we shall make allusion to various diseases in the order of the extent to which they have been subjected to its influence.

An eminent professor is accustomed to observe, that when we see a great number of forms given to any remedy, this affords the best proof that not one of them has displayed pre-eminent marks of superiority. Almost every practitioner has his own method of prescribing iodine, which is conceived to possess particular advantages ; we may, however, at once set out with stating, that the conjunction of the pure principle with hydriodate of potash, is the form most generally approved of, whether for internal or external use.

Internally.—Pills of iodine conjoined with sulphur, were a good deal employed by M. Gendrin for the cure of gout. Mr Youatt, after a comparative trial, prefers a similar form in canine bronchocele. But general opinion has confined its sanction to the state of solution.

Of the *Tincture*, enough was formerly said to shew, that while an efficient preparation under proper management, it possesses no merits sufficient to

preclude the possibility of substituting a much more eligible form.

A *solution of Iodine in Hydriodate of Potash* was early recommended by Coindet; and the researches of M. Lugol have placed the value of this prescription in a very prominent light. The iodurretted mineral water of the Parisian physician, is a solution of iodine in its alkaline compound, so highly diluted, that each grain of iodine is accompanied by six or eight ounces of water. Professor Traill informs me, that his experience indicates the present method as the one in all respects the most convenient and trustworthy.

Externally.—In the vaporised form, iodine has been recommended by Sir James Murray,* and Sir C. Scudamore, as a local application to the interior of the lungs in phthisical affections. The addition of a little tincture of conium was found beneficial in subduing the irritating qualities of the gas.

The *Caustic Iodine* of M. Lugol, consists of iodine and hydriodate of potash, each an ounce, in two ounces of distilled water, and is used to destroy soft and fungous granulations.

As an *ointment*, either singly, or conjoined with hydriodate of potash, it has been used of different

* On Temperature, Aliment, &c. 1829.

degrees of strength, in friction upon tumours, or as a dressing to scrofulous ulcers.

An *Iodine lotion and rubefacient solution* have been found useful stimulant applications in strumous affections of the eyes.

The *Tincture of Iodine* has been used as a local irritant, and, by all accounts, is an eligible one; if only on account of the facility with which its effects may be regulated in cases requiring a prolonged action. Where the irritation on any occasion threatens to run too high, a starch poultice offers the obvious means of counteracting any excess.

But of all the external methods of using iodine, that of its universal application by diffusion through a warm bath, has been the most extolled. M. Lugol, with whom the idea originated, first tried the effect of immersing the patient in a solution of three ounces of hydriodate of potash; but as this only produced slight itching, while the tincture, and iodine in the solid state, proved objectionable additions, because the vapour sublimed in the former case, gave rise to cerebral congestion, and in the other instance the iodine was deposited, he fixed upon the conjunct employment of iodine and hydriodate of potash, in order that the compound might retain the element in solution.

Whether the benefit said to arise from iodine as thus applied, at the Hôpital St Louis, proceed from its direct absorption into the system, as hinted by the ingenious experimentalist, or whether, on the other hand, the character given by himself to the ioduretted ointment, namely, that its effect is proportioned to the degree of its local action, does not equally apply in the present case, may admit of question ; at all events, if iodine really enter the system, the same passage is open for its reception which has furnished the constant source of fallacy in experiments upon the absorbing property of the skin. In the course of examining with what degree of probability the entrance of iodine could be calculated upon in the administration of medicated baths, I made the following observations.—

Experiment 6.—1. A few grains of dry iodine were introduced into a glass-stopper bottle, measuring about two ounces, also carefully dried. The temperature was lowered by a freezing mixture, to 5 on the negative scale, and the stopper being removed, a piece of starch-paper was suspended about an inch above the solution, with precautions that it should not touch the sides of the vessel. Immediately, the well-known colour of iodide of starch became conspicuous on the paper.

2. Tincture of iodine, at the same temperature, communicated the tinge freely.

3. Water saturated with iodine, was exposed to a freezing temperature. The colour was struck even after the congelation of the greater part of the liquid.

4. A solution of 3 grains of iodine and 6 of hydriodate of potash in an ounce of water, was placed in the same circumstances. The paper received a well-marked blue tinge during the progress of congelation.

5. Tincture of iodine, and solid iodine, respectively, added in small quantities to water, at 98° F., sent up such copious iodine vapours, as to make a strong impression on the nostrils, and, in the former case, to occasion lachrymation. The test paper received a violet colour.

6. Conformably to the numbers of the first of M. Lugol's formulæ for baths,* $\frac{3}{4}$ gr. of iodine was dissolved in a solution of $1\frac{1}{2}$ gr. of hydriodate of potash, and the fluid was diffused through a quart of water at 98°. A strong odour of iodine was sent off, of itself enough to indicate evaporation ; the paper, however, from

* Quarts of Water.	Troy. dr. Iodine.	Troy dr. Hyd. Pot.
No. 1. 200	2 to $2\frac{1}{2}$	4 to 5.
— 2. 240	2 - $2\frac{1}{2}$, 3	4 - 5, 6.
— 3. 300	3 - $3\frac{1}{2}$	6 - 7.

Page 180.

whatever cause, was affected doubtfully, if at all. A portion of the liquid heated in a retort lost its colour, and sent over a vapour containing free Iodine.

Whatever then, may be the value of these baths in the hands of the physician, the physiologist will find it not easy to satisfy himself regarding their m o e of operating.

We shall now refer to the diseases in which iodine has been employed.

Bronchocele.—From the multitude of authors, in different regions, who have borne testimony to the utility of iodine in bronchocele, an ideal association has connected the one with the other, just as the name of strychnine calls up the recollection of paralysis. Dr Coindet cured, as he says, a vast number of cases, in from six to ten weeks; and the fidelity of this statement, as well as the rashness of those who contributed to give the remedy a bad character, is attested by Dr Seymour, who was present as the eye-witness. * Dr Gairdner says, the iodine very seldom indeed fails to give some relief, and commonly effects a cure. Of 116 cases treated by

* Illustrations of Diseased Ovaria. 1830. P. 112.

Dr Manson, seventy-six had the disease removed, ten were much relieved, seventeen were improving, eleven discharged for non-attendance, and only two fairly left without benefit ;* while, of the same number treated in India by the internal and topical use of iodine, fifty-seven were cured, and but five received no advantage.† The foreign journals are filled with proofs of the utility of iodine in this disease ; but for a clew to these I must refer the reader to the learned *Dictionnaire* of MM. Mérat and De Lens.‡

It seems, from what has been said, that the remedy is not invariably successful ; but if failures do occur, there are likewise states of the disease which should constitute them no criterion. In the early stage, when the enlargement depends simply on a gelatinous cellular infiltration, we may look forward with much confidence to its absorption ; but that, after the supervention of osseous and cystic degeneration, the natural structure should be renewed, surpasses the boundaries of reasonable expectation. A trial of the remedy, in such circumstances, can scarcely be expected to end otherwise than in disappointment.

Sometimes, however, the powers of iodine have been estimated, in a manner not strictly philosophi-

* Researches, p. 56. † Ed. Med. and Surg. Journ. xliii.

‡ Art. Iode.

cal, from results obtained where it was not used in its proper character. We find Dr Bardsley curing only ten, and relieving five, out of thirty cases of bronchocele;* but this judicious author treats of iodine and hydriodate of potash as if identically the same, while the latter preparation, in reality, was the sole form which he employed. †

Scrofula.

Having thus brought bronchocele so much within the control of medicine, Dr Coindet directed his remedy to other diseases supposed to be incidental to similar habits of body. At the head of these stands scrofula, properly so called; the "tumor induratus,

* Hospital Reports, p. 121.

† Dr Coster made a cure of an obstinate goitre, by spreading the iodine ointment over one side of the tumour after which the other was held to the positive pole of a galvanic trough, and reversing the process on alternate days. (Arch. Gen. de Med., ii. 430.) This fact is deemed the more deserving of attention, from the plan indicated having been recently recommended for more general practice.

This is not the place for discussing the origin of goitre; but those who feel an interest in this curious subject, will find excellent papers upon it in recent numbers of the Edinburgh Med. and Surg. Jour. and in the Dublin Med. Jour., May 1837.

Magendie states, that in passing through the Pyrences, he found the disease less frequent as the condition of the inhabitants improved, and the total number of goitrous individuals, much inferior to that observed twenty years previously, by M. Ramond. (Revue Med. Oct. 1825.) One of my friends, not long returned from

circa collum, et alas, et inguina," in which, as well as where the surface was broken, a multitude of succeeding writers as Sablairoles, Baron, Brera, Magendie, and others, have confirmed its good effects, Sir Andrew Halliday, the first who employed iodine in this country, succeeded in the cure of three cases,* and Dr Manson found it effectual in seven. But the statements of M. Lugol demand more lengthened consideration. By means of iodine in lotions, ointments, baths, &c. as well as by giving it internally with extreme circumspection, the Parisian physician represents himself as having overcome cases of the most frightful and aggravated description; caries alone,† and that not always, maintaining an opposition to its salutary career.

Several practitioners of judgment and experience, among whom are Dr Alison,‡ Dr Cumin,§ and M. Baudelocque,‖ express themselves in a far more sub-

Switzerland, informs me, that to the introduction of the potato the natives of Chamouni ascribe the comparative exemption from goitre, which they enjoy at present. The valley of Chamouni is covered with snow for a longer period than many alpine districts where this disease is abundant.

* London Med. Repos. September 1821.

† On Scrofula, p. 48.

‡ Cyclop. of Pr. Med. Art. Hist. of Med.

§ Ibid. Art. Scrofula.

‖ Etudes sur la Maladie Scrofuleuse.

dued manner, regarding the sway which iodine appeared to them to exercise over scrofula. It is hard indeed to repress scepticism altogether, when the eye glances over certain passages in the Parisian work alluded to.* Yet the testimony which M. Lugol adduces to the support of his results is not lightly to be thrown aside, and while iodine is acknowledged by many writers to be the very best remedy for scrofula which we possess, the notable cures under consideration may be looked upon as valuable illustrations of what success may be anticipated from rigorous attention to every possible indication in the management of this disease.

Some histories of *phthisis* treated with iodine have been given, which are of a character to recommend its powers to more full investigation, when used at an early stage. The gaseous form is here the one that has been chiefly resorted to. In two instances, M. Berton found the appetite to become improved, at the same time that the cough and expectoration

* Take the following as an example—"*Case* 23: Caries of the vertebræ, lumbar abscess, white swelling of right arm, with four fistulæ, one of which discharged six pieces of the ulna, white swelling and exfoliation of the left elbow and the left knee. Extreme marasmus. Cure by iodine in six months." A cure perhaps only paralleled by some of those which Wiseman has attributed to the virtues of the royal touch.

diminished ; a third was stated to be gaining ground under treatment. From some trials made with the vapour of iodine, as well in phthisis as in other pulmonary affections, Sir James Murray arrived at a somewhat satisfactory conclusion ; but it is principally the more careful and extensive researches of Sir C. Scudamore, which afford reason for entertaining favourable hopes from its employment in this manner. Dr Elliotson, however, tried the inhalation three times to no good purpose ; besides, on account of the irritating properties of the iodine, he thought it necessary, like the previous writer, to prescribe the vapour of conium along with it ; whereby the results of course are rendered complicated.

In *strumous ophthalmia*, iodine, given internally, and aided by other local applications, was found very useful in four cases by Dr Manson ; M. Lugol also tried it with his usual good fortune, both as a topical and internal remedy. In some cases I have seen advantages obtained from it ; without however entering into any details of these, I beg to refer the reader to the general results of the present practice, as carried on for a considerable period, at a much frequented charitable institution. The kindness of Dr James Hunter enables me to make known, with all the precision which can be required, a great number

of valuable facts; for which reference is made to the appendix.*

It may be added, as at least curious if not important, that old strumous cicatrices sometimes regain the natural colour during the use of iodine. This was first observed by Lugol, and it is confirmed by a statement I have received from Mr Wright. A patient who was taking four grains of iodine daily, for a liver complaint, noticed that the cicatrices of an old issue in the leg, put on in the course of three weeks more and more of the natural hue, and in ten days from this the general colour of the surface was found to be uniform.

Nervous Diseases.

The work of Dr Manson gives the first account of iodine as related to these affections. Of five cases of paraplegia, two were cured, one relieved, and two slightly improved. Of eleven cases of paraplegia, six were cured, one derived much relief, and four were improved; six cases of local palsy, and one of lead palsy, were cured. Of seventy-two persons treated for chorea, sixty-two received a cure, two were relieved, five discharged, and three under treat-

* Appendix, Letter C.

ment.* Dr Elliotson effected a cure in paralysis with the tincture, which he attributed to the absorption of some effused matter.† Two examples of chorea recovering under the same treatment, after other means had failed, are mentioned by Dr Gibney.‡

Dr Bardsley says, he has seen little or no benefit obtained from iodine in paralysis, and has derived good effects in only two cases of chorea; he is at a loss therefore to reconcile his results with those of Dr Manson. But as Dr Bardsley used the hydriodate of potash and not the tincture, perhaps the comparison may not be altogether legitimate.

In a characteristic hydrocephalic enlargement, Dr Caldwell reduced the circumference of the cranium three-fourths of an inch within ten days, and was finally successful, by rubbing an ointment of iodine upon the open part of the head. The only observed physiological effect was increased micturition.‖

A man labouring under coldness, numbness, and immotility of the right arm, of four days' standing, brought on by holding it in a constrained posture,

* In the Dict. de Mat. Med. the proportion of cures is much understated; the present enumeration will, I believe, be found correct.

† Lancet, 1830–31.

‡ Lancet, 1827–8, p. 54.

‖ Ibid., 1832–3, vol. ii.

after applying many stimulants without avail, submitted himself to Mr Wright's care. The tincture of iodine being rubbed on, occasioned a moderate sensation of warmth; by the next day the functions of the limb were somewhat improved, and a few renewals of the dressings completed the cure.

The epileptic subject, to whom Dr Franklin gave the large doses formerly adverted to, was relieved of his complaint.

Diseases of the Generative System.

Amenorrhœa.—Dr Coindet recommended iodine in this disease, but Brera and Sablairoles chiefly, have illustrated its value by experiment. Professor Brera is generally considered to have obscured his practice by too great a complication of remedies.*

Leucorrhœa.—The two last named authors, together with MM. Gimelle† and Goeden, are also advocates for iodine in Leucorrhœa. Mr Jewel's experience inclines him to regard it as peculiarly adapted for the removal of this disorder.‡

Tumours of the Uterus.—We have a few recorded instances of iodine, taken internally, directing its influence to the diminution of these growths. A very aggravated case occurs in the transactions of the

* Saggio clinico sull' iodio. † Revue. Med. vii. 249.

‡ Pract. obs. on Leucorrh., &c., 1830, p. 80.

Dublin College of Physicians,* where, by small doses of the tincture, Dr Thetford procured absorption of the disease, and restored the catamenia. An affection designated *scirrhous*, was similarly treated by Dr Klaproth, with equally pleasant results; the induration vanished, the discharge ceased, and the menses became regular. † And in a case related by Mr Jewel, the enlargement was removed, and the health and spirits returned, from taking the tincture in increasing doses from ten to thirty-five drops. But the most complete inquiries are those of Dr Ashwell, inserted into the reports of Guy's Hospital; seven cases are given, in which iodine, internally and locally, effected a cure. This gentleman insists strongly on the distinction between tumours of the body, and those of the neck of the organ; the former being more of a parasitic character, while the glandular and secreting structure of the cervix renders it a distinct seat of disease, and more amenable to treatment. The "melting down and resolving of hard tumours," alluded to by Dumeril, Serres, and Magendie, as observable in the action of iodine, accords with Dr Ashwell's experience.

Tumours of the Ovaries.—Dr Bacon and Dr Gairdner speak highly of iodine in these refractory

* V. 510, 1828. ‡ Revue Med. Mars 1824.

growths ; Dr A. T. Thomson cured three cases with it,* and Dr Elliotson thinks no remedy its equal.† A large specimen subsided, under Dr Bardsley's care, through the use of the tincture, and an ointment containing hydriodate of potash.‡ In an instance related by Dr Stokes, where life was despaired of, the use of Lugol's mineral water produced a rapid cure. §

Gonorrhœa.—After subduing any violent symptoms by leeching, &c. M. Richond found the recovery of the soldiers under his care accelerated by the tincture of iodine, given internally, and applied locally as a stimulant.‖ Mr Caswall likewise represents that he has seen benefit from it, both in the acute and secondary stages.¶ M. Henry was twice successful with the tincture given internally.

Syphilis.—It is chiefly in debilitated venereal cases, where ulcerated skin and throat, inflammation of the bones or periosteum, and a cachectic habit, preclude the idea of mercury, that iodine has been thought likely to prove an acquisition. On the hypothetical notion, in fact, that mercury and iodine constitute, the one the specific antagonist of syphi-

* Lancet, 1829–30. † Ibid. 1830–1.
‡ Seymour's "Illustrations of diseased Ovaria," 117.
§ Ryan's Jour. iv. 200. ‖ Arch. de Med. iv.
¶ Med. Gaz. 1834.

lis, and the other of scrofula, it was that Coindet conceived great hopes from conjoining the two in certain cases.

In a recent number of the Medical Gazette, Mr Mayo has furnished his experience in four examples of the above description, which got well under the ioduretted hydriodate of potash ; his results would well recommend the remedy to an ampler trial. Brera prefers iodine to mercury in syphilitic bubo.

A man with secondary symptoms, appearing, from his emaciated state, to be on the verge of dissolution, was placed by Mr Wright upon Mr Mayo's treatment ; at the expiration of three months, this gentleman says, he never saw so remarkable an example of transition from decay to renovated vigour.

Skin Diseases.

M. Kolley administered the tincture of iodine to four patients with chronic scaly eruptions ; two derived benefit, in a third the smallest dose gave rise to headach and sweating, and the fourth only had a chest complaint aggravated. * On the other hand, Dr Jeffray of Liverpool affirms, that "almost never-failing success" has attended his administra-

* Jour. Compl. xvii.

tion of it, in herpes, psoriasis, and lepra vulgaris. The radical cure of tinea by iodine, taken for a scrofulous affection, occurred in an instance related in the Lancet for 1826. A case which I lately saw in the Edinburgh Hospital conveys a less favourable impression. It was one of lepra of six years' standing; both legs were equally affected, and were dressed, for the first fortnight, with citrine ointment, when the relief obtained not appearing sufficiently rapid, an ointment composed of iod. 3i, hyd. pot. 3 ij, to an ounce of lard, was then substituted, for the left extremity. The report upon the Journal, twenty-four days after, is as follows :—"Right leg improved ; left better, but less improved than the other.

Applic. ung. hyd. nit. utrique cruri."

Dropsical Effusions.

A patient labouring under ascites got well under treatment by Dr Elliotson with the tincture of iodine, and the topical use of an ioduretted ointment.* Dr Coster says he has subdued many dropsies by the following method :—Internally, iod. g. iij hyd. pot. g. vi. Aq. ℥j m : dose, six to fifteen drops; aided by an ointment composed of iod. g. xv with double the quantity of hyd. pot., and an ounce of lard, to be placed inside

* Lancet, 1830–31.

the thighs after removing the cuticle by a blister. The arm-pits and soles of the feet are also rubbed with the ointment.* The same plan seems also to meet with Dr Osborne's approval.†

In connexion with *hydrocele* iodine has been latterly brought into prominent notice by Velpeau, M. Ricord having previously been successful by the topical use of compresses dipped in the tincture of iodine diluted with water. ‡ The proposal of M. Velpeau, to the support of which he adduces twenty cases, is to inject the same liquid into the scrotum, and its advantages are said to be that, while efficient, it requires no complicated apparatus, and entails no risk in case of infiltration. The instrument should be of a material not liable to be acted on. §

Enlarged Liver and Spleen.

In several cases of chronic disease of the liver, attended with jaundice, Dr Abercrombie says he has seen an ointment composed of 3ss. of iodine and

* Jour. de Phar. 1834. † On Dropsies, p. 48.

‡ Ryan's Jour.

§ Arch. Gen. Janvier.—Gaseous chlorine has lately been used for injection in hydrocele, it would seem with great effect.—(Dub. Jour. Jan. 1837.) I may notice here, in reference to the analogy between chlorine and iodine, a fact mentioned to me by Dr Traill, viz. that the sole effect of breathing a chlorine-impregnated atmosphere observed in the manufactories at Glasgow, Manchester, and Belfast, is absorption of the fat.

an ounce of axunge prove of much service. * Dr Milligan reduced an enlarged liver in a child ; and Dr Elliotson obtained a very rapid diminution by iodine locally, and hydriodate of potash internally. † The last mentioned physician gave the tincture without avail in a case of jaundice. ‡

Dr Milligan also prescribed the tincture with good effect in three cases of hypertrophy of the spleen, occurring in children, and a case where it seems to have been beneficial, joined to the external use of hydriodate of potash, is mentioned in the Medical Gazette, 1830–31. §

Diseased Prostate Gland.

Dr Trüsted related in the Berlin medical newspaper a complicated case of stricture, enlarged prostate and testicles, and fistula in perineo, wonderfully relieved by tincture of iodine. ‖ An iodine suppository was found beneficial in enlarged prostate, by Mr Keate. ¶

* On the Stomach, &c. † Ryan's Jour. ii. 524.

‡ Lancet, 1826–7.

§ If Cruveilhier be not mistaken in eulogising iron as a specific for splenic enlargement, a trial of the *iodide of iron* would be interesting in this affection.

‖ London Med. and Surg. Jour. 1833–4.

¶ Lancet, 1832–3, p. 672.

Iodine has been found of service in many other diseases. Brodie twice relieved *rheumatism* with the tincture, though in one of the cases only temporarily.* Two cases of *phlegmatia dolens* were cured by Mr Bacon with the iodurettted hydriodate of potash.† In *deafness*, dependant on different local causes, iodine has been used both internally and topically, with oft-repeated success, by Mr Buchanan,‡ Dr Manson,§ and Mr Darwin.‖ The former was successful with the tincture applied locally, in two examples of *un-united fracture*¶ an important result to which Mr Crosse adds a case in confirmation.**

Incipient *fungus hœmatodes* is thought by Mr Fahnestock to have been checked by iodine internally, and hydriodate of potash applied to the part.†† Five cases of ganglion, and two of periostitic tumour were cured by M. Ricord by the local application of the tincture.‡‡

* Lancet, 1832–3. † Ibid.
‡ Illustrations of Acoustic Surgery, 1835.
§ Researches, p. 305. ‖ Ryan's Jour. 1832.
¶ Essay on Diseased Joints, &c. 1828.
** Med. Gaz. 1830. †† London Med. and Phys. Jour. 1829.
‡‡ Lancet, 1832–3 il. 130.

IODIDE OF POTASSIUM.

Of the several processes recommended for preparing this compound, the simplest is the one suggested by Dr William Gregory, as an improvement on that of Dr Turner. It consists in adding iodine to a hot solution of potash until the fluid assumes a yellowish-brown colour, then evaporating, and heating the residuum to low redness in a platinum crucible. The mass, which at first consists of iodide of potassium, and iodate of potash, thus loses all its oxygen and becomes converted into iodide of potassium.*

The iodide of potassium (or hydriodate of potash, as it is familiarly termed) volatilizes at a strong red heat. It dissolves in water and alcohol, and has the power, when in solution, of dissolving a portion of iodine equal to that contained in its own composition, forming, according to M. Baup, a definite compound.† Gay Lussac ascertained that the property of dissolving iodine is common to all the hydriodates; but that the connexion is destroyed by ebullition, and

* Ed. Med. and Surg. Jour. xxxvi. 369.

† A curious fact was related to me by Dr J. A. Robertson, viz., that the ioduretted solution of hydriodate of potash loses its colour, and at the same time its stimulant action on the eye, far more readily if made with distilled than with common water.

does not effect the neutrality of the hydriodate.* It has been already shewn that the iodine evaporates from its solution in hydriodate of potash at a freezing temperature. M. Devergie states, that hydriodate of potash does not change the colour of wine, beer, cider, coffee, tea or milk ; and, he might have added, of albumen.† There has been no proper antidote pointed out as yet, for although M. Donné has proposed the vegetable alkalies, we may allow with Devergie that the remedy appears worse than the disease.

The iodide of potassium is very liable to admixture with carbonate of potash. In one specimen, Dr Christison found only 9.5 per cent. of the genuine constituent,‡ the rest being made up of the carbonate together with water, and in a Glasgow specimen he detected 64 per cent. of the carbonate of potash.§ At a discussion of the London Medical Society, having reference to Dr Elliotson's practice of administering this compound in doses of two drachms, Mr Pereira stated his belief, that but one house in London sold it pure.** A shop of the

* Annales de Chimie, xci. 72

† Med. Legale, ii. 534.

‡ Treatise on Poisons, 3d Ed. 182.

§ Duncan's Dispens.

** Lancet, February 1832.

very highest repute had afforded him a specimen which contained 75 per cent. of the carbonate. Of twenty specimens examined by Dr O'Shaughnessy, only two were free from admixture.* I am acquainted with one instance, where that which went by the name of hydriodate of potash at a public charitable institution, was neither more nor less than the carbonate of potash. Sometimes, also, the chloride of sodium has been added for the purpose of imposition.

For an easy method of detecting the sophistication with carbonate of potash, I am indebted to Dr Traill, who practised it as early as 1826—tincture of iodine added to the suspected compound, loses its colour if the carbonate be present. Mr Pereira proposes to immerse one of the crystals in a little lime water, when the presence of carbonic acid will be indicated by the fluid being milky. To test for common salt, the same pharmacologist describes a process founded on the capacity of ammonia to dissolve the chloride and not the iodide of silver. On adding nitrate of silver to the suspected sample, any carbonates, chlorides, and iodides, are thrown down; digesting the precipitate in ammonia, you take up only the carbonate and chloride, and on adding ni-

* Lancet, February 1832, p. 635.

tric acid to this solution, the carbonate is converted into nitrate, and the chloride is precipitated.

The iodide of potassium should not be prescribed along with salts of copper, silver, lead, and mercury.*

Physiological Action of the Iodide of Potassium.

It was the alarm occasioned by the imprudent use of free iodine that incited Dr Coindet to contrive some method which might include the advantages of the remedy without its danger. The result was a recommendation of the sole external use of the hydriodate of potash, with the effects of which he was so well satisfied, as to style this "the completion of his discovery." The suggestion, however, did not meet with general approval. The chief use that has been made of this compound among the profession at large is that of a solvent for iodine; or when applied alone externally, the internal use of iodine has been very commonly conjoined with it. For this reason, instances illustrative of the uncombined action of hydriodate of potash, are rarer than might be supposed.

1. *External Effects.*—On the surface of the skin this substance produces much less remarkable effects than iodine. In four patients upon whom Lugol

* Thomson's Mat. Medica.

tried the influence of warm baths containing three ounces of hydriodate of potash, nothing save temporary itching fell under observation.* Mr Dendy, however, found it sufficiently powerful in the form of ointment (along with the tincture taken internally), to cause ulceration round the base, and final eradication of a wen, within three or four weeks.† In a case where I applied the ointment to a scrofulous ulcer, it occasioned considerable smarting. From certain facts stated by Dr Zink‡ and Dr Gairdner, it would seem to undergo absorption through the cuticle; not only did tumours in distant situations disappear, during the practice of spreading some of the ointment on particular surfaces, but the last named gentleman has even witnessed the supervention of gastric pain and copious bilious diarrhœa. To the deficiency as regards local stimulation alluded to, is owing the so frequent addition of free iodine in prescription.

M. Devergie, who was the first to occupy formally our present field of physiological inquiry, could perceive nothing farther than local irritation to ensue, from two drachms of the hydriodate of potash being placed beneath the skin of a dog, whether so-

* On Scrofula, p. 65.

† Lancet, 1832–3. ‡ Jour. Compl. xvii. 215.

lid or in solution. That we are not to infer from thence that its influence did not extend over the system, is rendered apparent by what I am about to mention.

Experiment 7.—At ten o'clock A. M., I injected three drachms of hydriodate of potash, dissolved in half an ounce of tepid water, beneath the skin of the back of a strong common-sized terrier dog. The animal, for two or three minutes, seemed to be in great pain, but after this time recovered and took his food as if nothing had happened. Towards evening he was evidently in low spirits, though still inclined for food; in the night, he passed two black, scanty, semifluid stools; the following day he maintained the same constant posture on the side, rejecting nourishment, and complaining loudly if handled. On the third day, the animal lay stretched completely on the side, the eyes and mouth closed, and the jaws moist with saliva; under which circumstances death took place late in the evening.

Inspection.—The body was rigid. Over the artificial cavity for the poison, the hair and cuticle easily came away, and the walls were lined with a layer of thin, soft matter, resembling in appearance

* Arch. Gen. de Med. x. 260.

cream tinged with blood. The right cavities of the heart were filled with dark fluid blood; the left ventricle contained a small dark coagulum. The stomach was flaccid, but contracted slightly on exposure to cold water; its inner membrane presented moderate diffuse redness; a few longitudinal coagula at the cardiac extremity, and here, as well as near the pylorus, two or three small and rounded blood-red extravasations. The spleen was congested; gall-bladder full. The bladder of urine which was nearly full, presented externally a dark cinnabar-red hue; it contained a fluid of the colour of venous blood, which coagulated by heat.

On chemical examination, I detected combined iodine in the blood from the heart, in the brain and spinal chord, the liver, spleen, stomach, muscles, tongue, and the bones freed from their appendages: likewise in the contents of the bladder.*

Experiment 8.—Thirty grains of the hydriodate of potash, dissolved in two drachms of tepid water, were injected beneath the skin on the back of a rab-

* Nothing could be more simple than the process employed here, it being merely requisite to boil the tissues minutely divided, and apply the ordinary tests to the filtered fluid.

bit. The immediate expressions of pain were as strong as in the preceding case. The next day, no change being perceived, a similar solution was again thrown in; upon this the animal soon began to droop; on the third day, it showed evident signs of weakness, and on the fourth day it died, with no other remarkable symptom.

The interior of the artificial cavity was highly vascular compared with the adjoining tissues. No lesion was discovered in any internal organ. The contents of the bladder changed to deep blue on being tested with starch and nitric acid.

2. *Effects when taken internally.*—The greatest possible discrepancy, even worse than that with regard to iodine, exists at present concerning the dose and physiological action of hydriodate of potash. In 1829, an epidemic appeared in France,* having for its characters, nausea, pain of stomach, and slimy or bloody diarrhœa, or else abdominal distention, ophthalmia, swelling of the face and legs; it attacked 150 persons, and was traced by Serullas, and by Boullay and De Lens, to the fraudulent sophistication of common salt with kelp. The consumers of this domestic article had been in the habit of taking

* Christison on Poisons.—Pp. 185, 605.

along with it 1 per cent of hydriodate of soda,* besides a little free iodine.

This fact, established as it is on unquestionable evidence, may be taken at setting out as sufficient to shew that hydriodate of potash can, under certain circumstances, prove injurious ; that it is not one of those substances which, like common salt, may be consumed to almost any extent with impunity.

From the powers of the compound being as yet unsettled, and the terms *small* and *large* applied to doses having merely reference to their effects, it is impossible to institute the same subdivision into small or medicinal, and large or poisonous doses, which was before found convenient. In this uncertainty it will be the proper plan to begin with what seems to be established by experiment.

M. Devergie has stated the following among his results—

1. Half a drachm of hydriodate of potash, dissolved in ℥ss. of water, slowly injected into the jugular vein of a strong dog, produced a feeble cry and general spasmodic contraction, with evacuation of the urine and fœces ; in a few seconds the animal fell

* Dr Coindet finds the hydriodate of soda analogous in its effects to the corresponding compound of potash.

powerless, with the saliva flowing, the tongue hanging out, and its fibres oscillating. When opened ten minutes afterwards, the body exhibited the brain and spinal cord congested, and partially coagulated blood filling the right cavities of the heart.

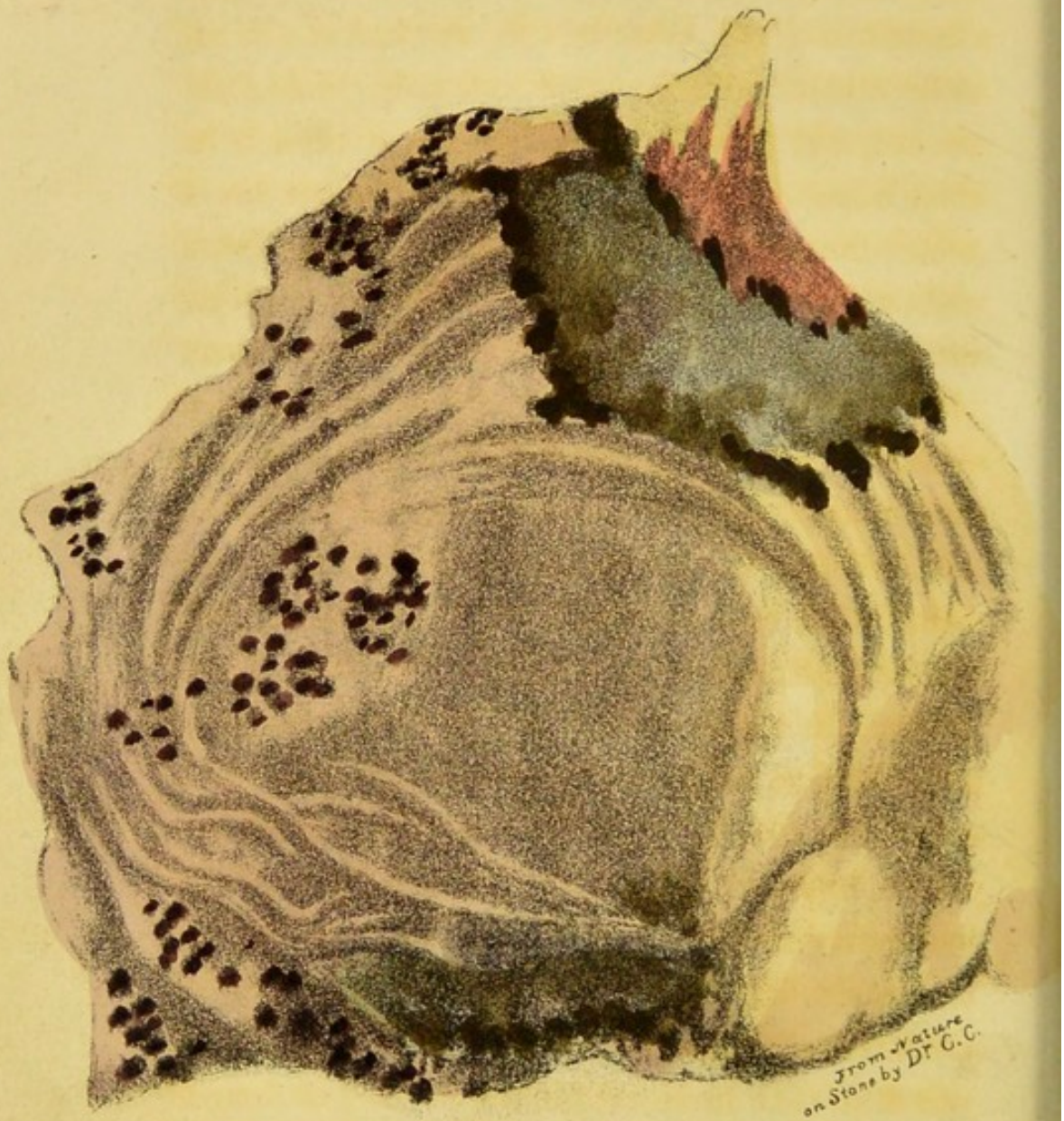
2. In a similar experiment with four grains, on a smaller dog, death took place in about a minute.

3. A quantity of the hydriodate in solution produced vomiting. Devergie then introduced a solution of two drachms, and tied the œsophagus. Immediate depression followed, and death on the third day.

4. Three drachms in solution destroyed a larger dog (with the gullet tied), in about the same time. The body remained flaccid after death.*

To throw doubt upon these representations, because they seem inconsistent with later experience, would argue a forgetfulness of the old canon, "Ab ignoratione modi non valet consequentia ad negationem existentiæ rei," inculcated by Hoffman† upon medical men in particular; but as it was thought possible that dogs might possess some peculiar susceptibility, or that the ligature on the gullet might have vitiated the conclusions, a different animal was chosen for the following experiment.

* Loco cit. † De diab. pot. in corpora.


From Nature
on Stone by Dr C.C.

Experiment 9.—I injected a drachm of the hydriodate of potash, dissolved in two drachms of water, through an elastic tube, into the stomach of a strong male rabbit. The animal instantly became depressed, and refused its food; in two or three hours there was a scanty stool, and a very abundant flow of urine; the next day the rabbit was exceedingly feeble, and on the third morning was found dead, with the fore legs apart, and the head resting between them.

Inspection.—The stomach, which was filled with vegetable matter, contracted on being washed with cold water. Several small coagula of blood were scattered over the inner surface, and the lining membrane itself was penetrated with crowds of small bloody extravasations, bordered by brownish-red areolæ. A large ecchymosis of this kind, appearing to be an aggregate of smaller ones, stretched for nearly an inch from the cardiac orifice towards the great curvature, in part covered by a thin, translucent membrane, ragged at the edges. The lower part of the œsophagus was highly vascular. The colon near its termination was inflated and empty. The bladder was filled with urine, which proved on examination to contain abundance of iodine in a state of combination. *

* The annexed drawing is designed to represent the appearances

In the two last mentioned experiments of Devergie, this author found the stomach contracted, its villous coat red and vascular, and containing a blackish liquid in its cavity. The organ in the first of these animals had several bloody effusions between the mucous and muscular layers, and a great number of longitudinal clots on the inner surface, following no particular direction ; while in the other instance, besides these appearances, he observed one spot as large as a five franc piece, and this, as well as some of the smaller spots, penetrated with little ulcers. The upper half of the small intestine was marked with a number of red vascular patches.

Such are the effects of hydriodate of potash upon two descriptions of animals materially unlike, whether as regards habits, appetites, or physical conformation. They are the indications of a power of producing irritation scarcely capable, when exerted on the human subject, of being overlooked, provided it then suffers no abatement. But, in reality, we are not without examples presented by individuals of our own species, where the same deleterious influence seemed to hold an unmodified sway. To a female who swallowed an ounce and a half of an iodureted solution of hydriodate of potash, the conse-

described in the stomach of this animal, the lower part of the œsophagus being seen above, and the pyloric extremity to the right side.

quences were general uneasiness, nausea, acute pain and burning heat of stomach, followed in an hour by spontaneous vomiting, headach, and vertigo. Recovery took place after the lapse of twelve hours.

The example just quoted is certainly not qualified to establish any well defined inference, because the effects of the two ingredients cannot be correctly distinguished from one another, although it has its value if it be only so far as shewing that their combined action is very energetic.*

One of the most zealous advocates for the "anti-homœopathic" use, as it has been termed, of the hydriodate of potash, is Dr Wallace of Dublin, well known for his excellent researches into the medicinal virtues of chlorine in liver affections. He prescribes about half a drachm of it to each patient in the course of a day, and, founding his opinion on a great number of observations, considers himself justified in recommending this as the only effectual practice, and one at the same time free from all hazard. A narrow inspection, however, of such data as he has afforded us hitherto, is certainly not calculated to make so favourable an impression on the minds of his readers. This subject we shall presently allude to more particularly, it being sufficient for

* Jour. de Chimie Medicale, iv.

our present object to notice what was the result when the usual daily quantum happened accidentally to be doubled. Two female hospital patients took on the same day an entire drachm of hydriodate of potash ; they were attacked with nausea and vomiting, colic pains, slight diarrhœa, frequency of pulse, and exhaustion ; what deserves particular attention being, that the symptoms were in both precisely alike. It also merits recollection that the medicine seems to have been taken, not all at once but in divided doses.*

The accounts which have just been given of the effects of the hydriodate of potash, would, in the absence of contradictory evidence, fairly bring it within the scope of Dr Mead's definition of poisons. "Things so contrary to animal life, as in a small quantity to prove destructive to it."† Devergie (Medecine Legale) uncompromisingly ranks it as a poison, and states the fatal dose at a little higher than that of iodine, estimating the latter at 15 or 20 grains. His idea of its virulence may possibly be exaggerated ; be this as it may, it serves to increase the perplexity, and render more startling the transition to the opposite view of the question.

* Lancet. March 1836.

† A Mechanical Account of Poisons, 1756, p. 21.

In the Lancet for 1831–32, will be found the first account, so far as I am aware, of the exhibition of this compound in doses very much exceeding the ordinary standard. Finding that two or three grains daily, as usually ordered, were ineffectual in affording relief in certain organic diseases, Dr Elliotson, whose enlightened efforts have tended so greatly to improve our acquaintance with the proper limits of many valuable remedies, began, in a case of scirrhus uteri, with administering a drachm and a half, then two drachms, and, finally, six drachms in the course of the day, the patient taking at the same time from 20 to 40 grains of the extract of conium. The result was, relief from pain, unalloyed by sickness, or any other unpleasant feeling; the local affection, unfortunately, there was no opportunity for examining. A strumous patient took the largest of the above quantities for many weeks; another with hypertrophy of the spleen took 4 drachms daily for several months; to a third, labouring under chronic hepatitis, 3 drachms were given daily, for the same period, and in every instance the benefit obtained was surprising.

Magendie, who had been in the habit, prior to Dr Elliotson's researches, of exciting the astonishment of his Parisian brethren by prescribing 14 or

15 grains a-day, of the hydriodate of potash, has since been emboldened to exceed a drachm in twenty hours, without injuring his patient.* Double the last quantity, however, has been twice administered by Dr Buchanan of Glasgow, and, on one occasion, with laudable anxiety that the remedy should undergo a fair appreciation, he ordered two drachms to be taken over night, and the same quantity on the following morning.†

When viewed in contrast with the accounts by which they were preceded, statements of this kind draw very largely on our powers of comprehension.

There seems to be a very prevalent suspicion, that the article, administered in such large quantities, could not have been genuine hydriodate of potash. In one of his late lectures, Mr Pereira relates the story of a surgeon who spoke to him of having prescribed this remedy with the utmost freedom, asserting that no accident had ever happened in consequence;—on proper inquiry being made, however, the parcel from which it had been taken proved to to be very impure.‡ Dr Ryan has also repeatedly had occasion to animadvert on the sophistication of the hydriodate of potash.§

* Formulary, 1836, p. 110.
† Medical Gazette, 1836.
‡ Ibid. 1835-6, p. 839.
§ Ryan's Journal, 1833, p. 205.

It occurred to Dr Traill several years since, while practising at Liverpool, to see occasion, in more than one instance, for recommending the employment of this medicine to other members of the profession; the answer returned to him was, that it had been tried, and found to be inert, but on being tested with the tincture of iodine, the inactive drug turned out to consist almost wholly of the carbonate of potash.

These chemical facts, added to the analysis of Dr Christison and others, previously mentioned, might be presumed to let us at once into the secret of the difficulty, were we not on the other side assured, by authority which commands respect, that measures had been taken to ascertain the purity of the drug.

On the whole, does it appear unreasonable to surmise, that in the end we shall neither discover Nature to have been committing unwonted freaks, find reason to impeach the fidelity of any statement, nor even conclude the manufacturers to have dealt so fraudulently by us as appearances have been thought to indicate? * That consequences so different, and

* I allude to the more than possibility that the iodide of potassium may undergo spontaneous conversion into the carbonate of potash through atmospheric influence. To this view, several circumstances seem to point. The three degrees of purity in which the crystals are found in the market (the iodine of the two inferior being either in small proportion, or visibly, in the act of disengaging) the

sometimes opposite, should arise from one identical preparation, is a point on which the judgment is not easily satisfied.

Enough has been said to shew that, so far as it has been tried, the hydriodate of potash exercises a powerfully irritant action on the digestive canal of the lower animals, and that at least some individuals of our own species are liable to be affected in a similar manner. Dr Wallace observes, that sometimes purging, and at other times constipation, supervened while he was administering his usual doses, while soreness of the throat, heartburn, and flatulence, rather unequivocal symptoms of indigestion, are said not to have been "very uncommon."

Action of the Hydriodate of Potash on the Nervous System.

Some of the patients of the Dublin physician, while in the act of taking it, more particularly females in delicate health, complained of restlessness and want of sleep, but derived relief from laxatives. In one individual, however, who unadvisedly persisted in the use of the hydriodate for a protracted

gradual removal of this principle from the burnt sponge by keeping, and the facility with which the ointment of hydriodate of potash decomposes, are part of the grounds on which it is advanced.

period, the effects were such as to demand particular notice, from the circumstance of their affording us better grounds than are elsewhere to be met with for a comparison between the effects of the compound and those of iodine. The individual in question, having previously greatly injured his constitution by mercury, now had recourse to the hydriodate of potash for nodes and a tubercular syphilitic eruption, without taking care to receive proper advice. He became affected in consequence with indigestion, acidity of the stomach, soreness and constriction of the throat, and emaciation, but was relieved by quinine. Renewing the remedy, however, shortly afterwards, he was seized with violent headach, had a rapid quivering pulse, and exhibited an incessant motion of the eyes, like that of congenital cataract in a young person. These phenomena, ere long, terminated in muscular tremors and paralysis.

Several of the characters of iodism are here conspicuously marked.

Action on the Air-Passages.—Dr Elliotson refers on many occasions to a species of coryza, characterized by pain in the nose and forehead, and increased discharge from the nasal passages, as occurring while his patients were using the hydriodate of

potash.* The same symptoms were not unfrequently observed by Dr Wallace.

Action on the Kidneys.—A diuretic effect has been very commonly observed. In four or five patients labouring under ascites, with enlargement of the liver, who were treated by Dr Bardsley with from two to four grains of the hydriodate of potash daily, an increased flow of urine always took place ;† and Dr Elliotson considers a diuretic action to be its principal effect.‡ In the practice of Dr Wallace, the remedy acted at different times as a purgative or a diuretic ;§ but Dr Buchanan has invariably found it pass off by the kidneys without affecting the bowels.‖

Action on the Salivary Glands.—The most distinct instances of ptyalism to which I can refer, are two that are mentioned by Dr Wallace, without any statement of the particulars. One of these was a child four years of age, the other an adult. From the mode in which Dr Wallace expresses himself, it would seem that, in the former at least, the phenomenon was quite unequivocal, which is the more re-

* Lond. Med. and Surg. Jour. 1835.
† Hospital Facts, &c., p. 126, 1830. ‡ Lancet, 1831-2.
§ Ibid. Loc. cit. ‖ Med. Gaz. 1836.

markable, as children are so difficult to salivate with mercury.

Action on the Generative System.—Dr Bardsley observes, that several young women, to whom he administered the hydriodate of potash, did not menstruate till the sixteenth year. The opposite effect, however, was noticed by Dr Wallace. A female, while taking large doses of hydriodate of potash, became robust, and subsequently menstruated, although, for a period of two years, the catamenia had not appeared. Of the much dreaded atrophic influence upon the organs of this class, a single example presents itself in a case of cancer recorded by Mr Nesse Hill. In the space of four months, a large carcinomatous ulcer of the breast had almost completely cicatrized under the use of hydriodate of potash in the form of ointment, and taken in small quantities internally. By this time, *both mammæ* are stated to have completely disappeared.*

Action on the Skin.—Erythema has never been known by Mr Wright to be produced by hydriodate of potash, although he has frequently observed a pustular eruption; and this he regards as a favourable symptom. In two cases, Dr Wallace observed a remarkable in-

* Edinburgh Med. and Surg. Journal, 1826, p. 282.

crease of perspiration ; and he was acquainted with one instance where it unquestionably gave rise to purpura.*

Action on the Nutritive System.—Most of the authors quoted within the last few pages, speak highly in commendation of the influence of hydriodate of potash in improving the muscularity and vigour of the frame. We cannot perhaps altogether go along with the Dublin physician, in forming so very low an estimate as he has done, regarding its hurtful powers ; nor sympathise with his agreeable feelings in not having "witnessed any of the terrible effects which are said to result from the use of iodine," when diarrhœa, insomnia, purpura, coryza, paralysis, &c., are acknowledged to have sprung up on different occasions. "Great indigestion" would occur to few, as affording an indication of "an invigorated system," and "increased energy of the digestive organs."

It cannot but be suspected, that the doses employed by this gentleman were larger than the generality of cases seem to require. True it is, we find them exceeded by four times the quantity, in the practice of another eminent individual. Few, I believe, however, after what has been stated, would

* Loc. cit.

voluntarily submit themselves to the action of such doses. Mr Hill, in the cancerous case a little ago adverted to, could not exceed four grains and a-half at one dose, besides an ointment, without producing nausea and vomiting; and, just before writing this sentence, I returned from seeing a man with diseased liver, in whom four grains daily, in divided doses, produced after ten days such troublesome diarrhœa and griping pains, as to require the exhibition of anodynes.

Medicinal Effects of the Hydriodate of Potash.

Bronchocele.—The specific power of hydriodate of potash over bronchocele (if we may make use of the term specific to express an effect, of which the immediate cause is not evident), may be regarded as well ascertained, although the proofs to this effect, for the reasons already assigned, are not yet so numerous as in the case of iodine. Coindet was so well satisfied with the results of applying it locally, as to feel warranted in recommending this as the only unexceptionable mode of using iodine; but Dr Gairdner and others do not agree with him, finding such a plan by itself not sufficiently active. A man, sixty years of age, was cured by Mr Everett, of a goitre of four years standing, by g. $\frac{1}{2}$ of hydriodate of potash gradually in-

creased to three grains, and an ointment of the same externally.* Under Dr Zink's cure, a young woman, while rubbing the ointment upon an indurated breast, was astonished to find a goitre disappear without being able to understand the reason.† Dr Bardsley's results shew the remedy in rather an unfavourable light; out of 30 goitrous patients treated with this compound both topically and internally, 9 only were cured; 6 received benefit, and the remaining 15 derived no advantage.‡ Mr Youatt tried the ointment in canine bronchocele with some good results, but less satisfactory than those obtained from simple iodine given internally.

Scrofula.—Besides the testimonies of Dr Coindet and Dr Gairdner in behalf of the utility of this remedy in scrofula, we have the very high recommendation of Dr Bardsley, who considers it equal to, if it does not surpass, any remedy hitherto employed for that disease. Dr Zink made some trials, expressly with a view to determine the real efficacy of the ointment, without any accompaniment. From his experience in two cases, one where the glands were enlarged, the other an example of white swelling of the ancle-joint, he inferred that the remedy,

* Lancet, 1828–9. † Jour. Compl. xvii.

‡ Hospital Reports.

though powerful, takes long to manifest its action; but, likewise, that there is no danger in continuing it a sufficient length of time. To confirm the first of these conclusions, I may advance the authority of Dr Traill, who has been used, on this account, to conjoin iodine with the hydriodate of potash. The second might, perhaps, have been modified by further experience, as we find Dr Gairdner asserting, that the ointment produced pain and looseness of the bowels.

From among many interesting cases known to myself, tending to evince the utility of the remedy in scrofula, I select the following example, kindly communicated to me by Mr John Rose Cormack, on account of the marked connexion which it presents between the disease and the means employed for its relief.

"Ann —— is 19 years of age, and is evidently of a scrofulous diathesis. She has had repeated attacks of sore throat with enlarged glands, but none of such severity as the last, under which she had been labouring for three weeks before I saw her. A number of hard knotty tumours could be felt externally in the course of the lymphatic chain of glands; on the right side, there was little swelling, but on the left there was great general tumefaction, with three or four distinct tumors, the largest about the

size of a pigeon's egg. The tonsils were greatly enlarged, and all the parts in the neighbourhood were highly vascular and painful. There was considerable injection of the left conjunctiva which was also painful. Tongue foul. Bowels regular. Catamenia regular. There was some pain of the chest, with a hot and feverish skin. Under the use of purgatives, and oak bark and alum gargle, the tongue became natural, the feverish state disappeared, and the throat improved rapidly. Along with these remedies, the following mixture was prescribed;

℞ Hydriod. Potassæ . ℥iss.
Aquæ Fontanæ . ℥iij.
M. et solve.

Of this she took a tea-spoonful three times a-day, till it was finished, when it was not again ordered, as the enlargement of the glands had wholly disappeared. The throat is still in an irritable state, and slight exposure to cold has brought on trivial relapses; but the glands have not again been affected. She never complained of headach or any other unpleasant effect from the medicine."*

* That nothing may be left unnoticed which can furnish a valuable hint, I may mention what was stated to me by Dr Stark, a gentleman already favourably known to the profession for his researches on the Relation between Colours and Odours. In attempting to cure enlarged lymphatic glands, by five-grain doses

In *phthisis*, Dr Baron (On Tuberculous Diseases, 1822), and after him, Dr Gairdner, conceived the hydriodate of potash to have been productive of great benefit in one or two cases of which the details are given; in other instances the malady had already gone too far to be checked by any remedy. Dr Bardsley obtained partial benefit for a time; but the symptoms soon increased, and death rapidly ensued.

Nervous Affections.—The present compound would seem to have less power over this class of maladies, than iodine in its free state, if we are to draw any conclusion from the comparative results of Dr Manson and Dr Bardsley. The former experienced almost uniform success, while the hydriodate of potash in the hands of Dr Bardsley completely failed in eleven cases of palsy where he gave it a trial, and only did good in two out of several cases of chorea.

Mammary Tumours.—We have twice or thrice

of hydriodate of potash, he found that great irritation was produced, but the disease not ameliorated. The tincture of iodine was then substituted, with complete success. This occurrence took place three several times, these being the only opportunities he had enjoyed of trying the remedy.

had occasion to allude to Mr Hill's case of cancerous mamma. Here a very large ulcer was almost reduced to a cicatrix, a small hard lump only remaining to become absorbed ; the disease, however, again broke out and carried off the patient. M. Locher Balber caused a mammary tumour to disappear by means of the ointment deposited in the axilla.*

Leucorrhœa.—A case is cited in a late number of the *Archives generales,* where a fluor albus of long standing was cured by friction with an ointment of hydriodate of potash inside the thighs, twice daily. In a month's time, with the aid of a substantial diet, the strength was completely restored.

Secondary Syphilis.—A case of nodes and ulcer of the leg was cured by Dr Elliotson, by means of hydriodate of potash in doses of five grains three times a-day. Eleven cases got well in the hands of Dr Bulloch ; these were characterised by destruction of the uvula and soft palate, nocturnal pains, eruptions, &c. ; and the treatment employed was, eight grains of the medicine thrice daily in camphor

* Lond. Med.and Phys. Jour. 1829 p. 272.

mixture.* But the widest researches are those of Dr Wallace; he has made the trial in 142 cases, and, from his mode of speaking, we may infer that his success has been of no ordinary kind. The full account of his treatment, therefore, of which we have the promise in a separate work, may be looked forward to with a great deal of interest.

Enlarged Liver.—It was in this affection accompanied with dropsy, that Dr Bardsley found the remedy most useful. In five cases, of which the particulars are given, the dropsy departed, and the patients were restored to health.

Dropsies.—A very obstinate case of *ascites* was cured by Dr Bain, through means of large doses of hydriodate of potash, and another in which similar treatment proved effectual, has been communicated by Mr Cumming to the Medical Gazette, October 1835.

Mr Ricord accomplished the cure of *hydrocele* by this remedy, in doses of a grain, gradually increased to five grains;† and an ointment rubbed upon the swelling proved effectual in a case recorded by Mr Wilkinson.‡

* Ed. Med. and Surg. Jour. 1837. † Ryan's Jour. 1833.
‡ Lancet, 1834–5.

Rheumatism.—The first time that the hydriodate of potash was tried in this affection, was by Dr Elliotson, who relieved a protracted case by doses of four grains, increased to seven and a-half, but afterwards reduced to five grains, on account of smarting of the eyes and discharge from the nostrils being occasioned by the larger doses.*

As the result of much experience on the subject, Professor Traill informs me, that the iodureted solution of hydriodate of potash as an internal remedy, aided by the topical use of the hydriodate of potash in the form of ointment, appeared to afford the readiest means of affecting the system, nor was there any hazard in this proceeding, in consequence of the close attention that was paid to supervening symptoms.

For the following cases I am indebted to the kindness of the distinguished Professor. Having been taken indiscriminately from his note-book, they are calculated to afford an impartial view of the success that may be ordinarily looked for in practice, from the use of iodine. The average may possibly appear too unfavourable, but to have endeavoured to render it less so, would be defeating the object had in view in the selection.

1. Bronchocele, and scrofulous glands of the neck.

* Lancet, 1836.

Miss ———, æt. 18. Very conspicuous enlargement of the thyroid, and enlarged glands on the sides of the neck. Ointment and ioduretted solution used with much relief.

2. Miss ———. Large bronchocele. Ointment rubbed in for three weeks, when the enlargement became almost imperceptible. Since married.

3. Miss ———. Enlarged glands of the side of the neck. Used both the ointment and solution, with no relief. Some of the glands suppurated.

4. A girl. Enormous enlargement of the submaxillary glands. Ointment and solution employed without benefit.

5. A girl æt. 6. Scrofulous ulcers and indurated glands. Lotion of hydriodate of potash to the ulcers, and took the ioduretted solution. General health much improved, and was then sent to sea bathing.

6. Similar case. No benefit.

7. Similar case. No benefit.

8. Similar case. Much benefit.

9. Miss ———, æt. 17. Enlarged thyroid. Unguent. hyd. pot. used with little effect. Then took the ioduretted solution internally, with almost complete obliteration of the tumour.

10. A washerwoman, aged between 45 and 50.

Had a tumour the size of a large lemon, just between the sterno-mastoid muscles, and touching the ends of the clavicle. It impeded respiration, especially when stooping. Pulsation distinctly to be felt, and veins much enlarged. Began to rub on the ointment, and take the solution twice a-day; during this treatment the tumour gradually diminished to one half its original bulk. The pulsation became more distinct from absorption of the interstitial deposited matter; the tumour resembled an aneurismal varix. Breathing relieved.

There has now been presented a digest of the physiological and medicinal effects of iodine, both in its simple form, and associated with potash, which the writer intended should include at least the greater number of the facts which have been published concerning them. Where a blank seemed to exist, he has sometimes attempted to supply the deficiency, and where statements were found to clash, it has been his endeavour to shew in what manner they might be reconciled.

To draw a comparison between the effects of the foregoing drugs is a matter of some difficulty. That they possess much mutual resemblance is allowed by common consent, as we may even infer from the ap-

parently unconscious manner in which they are indiscriminately spoken of; insomuch, that the term "iodine" often refers as much to one as to the other. Still it is plain that a difference does exist, and this not merely included in their relative powers of causing irritation, as some would have us think. Both affect the salivary and absorbent glands, produce iodism, and cure bronchocele, in whatever way they are applied to the system. But the compound is more tedious in its medicinal action; more than this, it has sometimes almost completely failed, for instance in nervous affections, where the employment of iodine has been attempted with eminent success.

All things considered, we are perhaps warranted in concluding, that in many of its most important characters, the action of hydriodate of potash bears a strong analogy to that of iodine.

IODIDE OF SULPHUR.

On mixing together iodine and sulphur, in single atomic proportions, they readily enter into combination, by the aid of a gentle heat. The iodide of sulphur is a solid substance, of a dark grey colour, a radiated and sometimes lamellar appearance, and exhales an odour of iodine. According to Gay-Lussac, the iodine sublimes by distillation with water ;* the vapour, however, is constantly rising even below ordinary temperatures. The mutual affinity of the constituents of iodide of sulphur appears therefore to be very feeble It communicates a stain to the cuticle, or to paper, and other organic substances, just similar to that which is produced by iodine. A portion of it placed side by side with free iodine on a portion of intestine imbued it with fully as deep and penetrating a colour, so that it would have been hard to distinguish which was the effect of either of these substances.

PHYSIOLOGICAL ACTION OF THE IODIDE OF SULPHUR.

Experiment 10. Three drachms of freshly prepared and pulverised iodide of sulphur were given to

* Annales de Chimie, xci. 12.

a terrier bitch, of moderate size, between pieces of meat. No vomiting was observed to follow. On the following day, the animal displayed no marked sign of depression, except refusing to take its food. The whole of the third day was spent in the recumbent posture, the animal evidently labouring under great lowness of spirits ; the fourth day she could not support herself properly upon her legs, the eyes were dry and glassy, but the pupils natural, and the cerebral functions apparently unimpaired. On the fifth and sixth days, the voluntary power was gradually restored. On the seventh, for the first time since the second, she took some nourishment, and two days subsequently, the power of progression was considerably improved. By the twelfth day no faculty appeared to be defective. The alvine dejections during the above period were few, hard, and scanty.

(Remarks upon this experiment are postponed for the present.)

MEDICINAL EFFECTS OF THE IODIDE OF SULPHUR.

The iodide of sulphur has been rarely employed in medicine, except for the external treatment of skin diseases. In these M. Biett is said to have found it of unrivalled efficacy, even to surpassing the protonitrate and the iodides of mercury, as a resolvent of the

tubercles in *lupus* and *acne indurata*.* In old standing *lepra*, Rayer prefers it for external use to calomel and white precipitate, and he ranks it in the first class along with the iodides of mercury, for the cure of *Lupus non exedens*.† Dr Copland has employed it in similar affections with advantage, and my friend Dr J. Y. Simpson—a gentleman, I have pleasure in pausing to remark, whose pathological knowledge has more than once assisted me in determining the character of deceitful morbid appearances—succeeded in curing with it a case of *acne indurata* where various other remedies had failed, and one of *acne rosacea*, after using a lotion of corrosive sublimate without benefit. It was prescribed for inhalation by Dr Copland, in phthisis and chronic bronchitis, but only in the latter disease was there any advantage gained.

From what has preceded, there seems to be no ground for supposing the present compound to differ from simple iodine in its peculiar effects upon the living economy. If the animal on taking it did not vomit, this may be accounted for by considering the vehicle in which it was given. The comparison with regard to medicinal effects fails somewhat on account of the deficiency of facts tending to the point. For

* Cazenave et Schedel. Mal. de la peau, pp. 219, &c.

† On diseases of the Skin, p. 634.

internal exhibition, however, iodine is well known as a valuable remedy in cutaneous affections, and Dr M'Lure has recorded the cure of a very aggravated case of impetigo figurata, by means of an ioduretted ointment.*

What would be the action of the iodide of sulphur were its composition more permanent, may afford matter for speculation, and we have reason to imagine, especially from what immediately follows, that it would display well defined characters. Unfortunately the want of this stability places multiplied difficulties in the way of drawing a legitimate inference.

COMPOUNDS OF IODINE AND CARBON.

Two substances resulting from the union of carbon with iodine, have been described by chemists. In one, the elements exist in equal proportions; in the other, the iodine is to the carbon as one and a-half to one, or as three to two. The latter, as having been the earliest discovered, and being usually employed to form the proto-iodide, shall first come under our notice.†

* Medical Gazette, xviii. 209.

† An account of two new and hitherto undescribed compounds of carbon and iodine has been furnished to me by my friend Mr

SESQUI-IODIDE OF CARBON.

On mixing concentrated alcoholic solutions of iodine and potash until the former loses its colour, you obtain a solution, from which the addition of water will throw down a yellow precipitate — the sesqui-iodide of carbon.

This substance is soluble in alcohol and ether, but insoluble in water. The ethereal solution yields large yellow crystals by slow evaporation.

PHYSIOLOGICAL ACTION OF THE SESQUI-IODIDE OF CARBON.

This substance, according to Dr Turner, has a sweet taste, and a strong saffron-like odour. Mitscherlich regards the taste as very disagreeable.* That it possesses a peculiar taste, argues some degree of solubility in the saliva. I am not aware of its physiological relations having been any farther examined.

Experiment 11.—At eleven o'clock A. M., an active, strongly-made terrier dog, was made to swallow fifty grains of the sesqui-iodide of carbon, concealed in a loose fold of paper. The day following, the

Samuel Brown of Haddington, the composition of which, experiment has led him to regard as follows: No. 1. Carbon 2, iodine 1. No. 2. Carbon 1, iodine 2.

* Traité de Chimie, par Valerius.

animal was in good spirits, and seemingly quite unaffected, except so far as was indicated by a disregard for nourishment. On the third day, he was indisposed to rise, and at length made but feeble efforts to crawl, the heart beating irregularly, and the belly being drawn in towards the spine. For the whole of the fourth day the animal lay stretched out on the side, and gave no sign of recognition ; the head extended, each respiration accompanied by a hollow moan, and followed by a universal convulsive movement, the mouth closed, eyes open, pupils natural, eyelids winked as usual. Death took place in the night.

Inspection. — Muscles remarkably rigid, hinder extremities extended, and jaws powerfully closed. Compression of the fore-legs upon the thorax occasioned a moaning noise, similar to that which was heard during the latter period of life. There was considerable congestion of the lungs and great veins, and the right cavities of the heart were filled with very slightly coagulated blood. The stomach, which was empty, had its inner membrane closely corrugated, the apices of the rugæ rose-red, while the sides were much paler, except where a small and rather undefined spot presented the deeper hue here and there. Near the pylorus, there was a small quantity of blackish fluid among the rugæ. The

whole tract of the intestines was contracted, but no other unusual appearance was manifested. Particular care was employed in examining the brain and spinal cord; but, so far from any lesion being apparent, it was plain, that both of these organs might easily have been taken for specimens of the healthy structure.

The blood, the brain, spinal cord, muscles of the extremities, liver, and kidneys, proved, on a simple analysis, to be strongly impregnated with combined iodine.

MEDICINAL EFFECTS OF SESQUI-IODIDE OF CARBON.

Dr Litchfield states, that he has used it with advantage in five examples of enlarged glands, two of *lepra*, and three of *porrigo*, in the form of ointment composed of 3ss of the powder to 3vi. of the simple cerate.* I am not aware of any other individual having tried it.

PROTO-IODIDE OF CARBON.

The previous compound, though discovered by Serullas, had its composition first accurately determined by Mitscherlich. The same chemist, on distilling it with an equal weight of corrosive-sublimate, procured a fluid heavier than water, which turned out

* Med. Gazette, August 1836.

to be a proto-iodide. As thus obtained, the present substance has an orange-red colour said to arise from iodine, and is mixed with chloride of iodine, from both of which it is liberated by washing with aqua potassæ, and the fluid then remains clear and colourless.

I was through an accident only able to preserve five drops. A spaniel dog being made to swallow the whole, shewed strong marks of disgust, by shaking his head, and champing with the jaws. In the course of an hour or two, the animal discharged his urine five or six times, and here the effect appeared to cease.

If we are entitled to draw any inference from a single experiment, the sesqui-iodide of carbon appears to possess a topically irritant action ; otherwise it diverges remarkably from the analogy of the preceding compounds. This product of the laboratory seems, in fact, to add another to the toxicological group of Strychnos and Brucea, of which the chief influence is directed to the spinal marrow, causing convulsions and difficult breathing, but no cerebral disturbance.* Its operation, however, is much more tardy. Hence, perhaps, the local irritation of the first passages, † which the above vegetable

* Christison on Poisons.

† There is a singular resemblance between the appearances in the stomach and those described by Dr Craigie in a case of cholera.—See Ed. Med. and Surg. Journ. 1833.

poisons rarely take time to affect. In respect of composition, it so far partakes of the vegetable character, that both the constituents are on the electro-negative side of the scale, and that the effect of either seems altogether different from their result when united.

IODIDE OF IRON.

For the preparation of the iodide of iron, one part of clean iron filings, or very fine iron wire, and three parts of iodine, are recommended by Dr A. T. Thomson, to be rubbed together in an earthen mortar, along with fifteen parts of distilled water, and then boiled in a flask until the fluid becomes clear and assumes a pale green colour on standing. The iodide of iron, or the hydriodate of the protoxide of iron, now exists in the solution.

The iodide of iron has so strong an attraction for moisture, that it cannot be procured anhydrous.* Exposed to the air it soon deliquesces. The strong tendency of the iron to become peroxidised, renders this compound exceedingly difficult to be preserved; this is best effected by keeping the vessel very tightly corked, or if it be in solution, by having the latter traversed lengthwise by a piece of iron wire.† Still

* Jour. de Phar. 1835. † Thomson's Mat. Med.

it is to be regretted that none of these precautions will ensure the exact strength of the medicine.*

The list of those substances which are incompatible in prescription with the iodide of iron is a formidable one. It includes, according to Dr Thomson, chlorine, the mineral acids, arsenious acid and the arsenite of potass, the alkalies and their carbonates, hydrosulphates of potass and ammonia, and hydrocyanate of potass, soluble salts of copper, lead, mercury, and silver, oxalate of ammonia, solutions containing meconic acid, gallic acid, or tannin, infusions of foxglove, belladonna, hyoscyamus, and tobacco, and solutions of fecula.

PHYSIOLOGICAL ACTION OF THE IODIDE OF IRON.

Dr A. T. Thomson, to whom medicine is indebted for the introduction of this remedy, resolved before making any experiments upon the sick, to try its effects upon his own person. He considers it to stimulate the whole length of the intestinal canal, producing the black colour of the discharges characteristic of

* The following incident may illustrate a fact, of the reality of which I have had ample experience. An eminent apothecary in this city who justly prides himself on the excellence of his preparations, having observed that he could preserve the solution by strictly following the above directions, I ordered a quantity ($\overline{3}$x, containing g xxiv to each ounce). On calling two days subsequently, the vessel, though full and tightly corked, presented a copious precipitate of brownish yellow flocculi.

iron, and that when the bowels are not affected it acts as a diuretic. Both the iodine and the iron are said to be capable of detection in the urine, when taken in small doses for several successive days. "The temperature of the skin is moderately elevated, and the insensible perspiration increased. On one occasion, having taken ten grains for a dose, it almost immediately caused an uneasy sensation at the epigastrium, accompanied with nausea that continued for several hours, and a slight degree of headach. These symptoms were relieved by a copious stool, which was perfectly black. Two hours after swallowing the medicine, a large quantity of urine was discharged, and on being tested, it displayed the presence of both the iodine and the iron."*

Experiment 12. A small but stout spaniel bitch, swallowed three drachms of the iodide of iron, enclosed between little pieces of meat. Two or three hours afterwards, she vomited some of the meat, together with small quantities of brown frothy mucus, and for twelve hours from this time, the vomiting was occasionally repeated; several loose, dark, scanty, stools were also passed. The animal now began to grow better, and in three days time enjoyed as good spirits

* The iron, Dr Thomson remarks, is easily detected by an aqueous solution of galls.

as usual. When seen last, after the lapse of a month, she appeared to be quite healthy.

Experiment 13.—A drachm of the iodide of iron, dissolved in a drachm of water, was given to a young rabbit of the full size, through an elastic tube. The animal remained motionless ; in two minutes it emptied the bladder and rectum ; in ten minutes the hinder extremities were allowed to lie loose as if paralysed, but when placed in the centre of the room the animal ran into a corner. Death took place in three hours and a half, with the appearance of gradually increasing debility.

On *inspection* the contents of the stomach presented a slight admixture of blood. The organ was flaccid ; of a bluish-grey externally, and had an extravasation in the course of one of the veins, the whole of which vessels betrayed considerable congestion. Almost the whole of the inner surface was of a dark olive tint, inclining to brown, except a small lake-red space below the cardiac orifice, while in many places the lining membrane would roll off in crumbling masses under the finger. The rectum was contracted and nearly empty.

The results of the preceding experiments indicate a strong irritative action on the part of the iodide of iron, and the necroscopic appearances last described,

might induce us to suppose this to be connected with a disorganizing tendency.

Experiment 14.—A solution of twenty grains of the iodide of iron in half an ounce of water, was slowly injected into the jugular vein of a very strong shepherd's dog. Violent struggles instantly followed, but the animal on being set free did not seem to suffer remarkably. In an hour there was a loose watery evacuation from the bowels, and the animal now began to stagger slightly in progression. For twelve or fifteen hours following, the stools, as well as the urine, were very frequent; the stools retained the same character, and the urine was found to contain combined iodine in abundance. The animal now took his food, and seemed to suffer little inconvenience from the operation.

Experiment 15.—At eight o'clock in the evening, I introduced forty grains of iodide of iron, dissolved in a drachm of water, into the left jugular vein of a tall lightly formed spaniel dog. This was done rather more rapidly than in the previous instance. The cries of the animal, for a moment feeble, soon became louder, the respiration was noisy and laboured, frothy saliva began to flow from the mouth, and the bowels and bladder were emptied. For eight

minutes the eyes took on a singular rapid movement transversely to and fro, and the irides were so dilated as to be scarcely distinguishable. The animal then succeeded with much effort in rising, and staggered about the apartment; in an hour and a half he vomited a quantity of frothy tenacious mucus, and made an ineffectual attempt to relieve the bowels, but soon afterwards discharged a quantity of dark blood. He continued wandering restlessly for above three hours, occasionally passing a bloody evacuation, then took the recumbent posture as if fatigued, the respiration rather loud but regular. In this state he remained till one o'clock, but at eight in the morning death was found to have taken place, the body continuing quite warm, and retaining its previous position with the extremities gathered beneath it. The cerebral faculties had not appeared to be deranged.

Inspection.—The muscles manifested no irritability under the stimulus of the knife. Both sides of the heart contained considerable quantities of dark fluid blood, which coagulated when exposed to the air. The lungs, although in other respects natural, were beautifully varied over the surface with dark purple spots of the size of a pea and under, produced by globular extravasation beneath the serous membrane, of which several similar masses appeared

more in the interior. Stomach and bowels contracted ; the inner membrane of the stomach was red and corrugated, the tint varying from rose-red to brick-red on the apices of the rugæ, while the furrows were less deeply tinged ; some of the folds near the pylorus lost their redness, and assumed a dark green dotted appearance.

The whole tract of the intestines was highly vascular. About 18 inches from the commencement, they began to be filled with bloody mucus, and a few inches below this, presented an intus-susception of two inches in extent, the superior portion of the gut being included within the inferior. There were no connecting bands of adhesion.

The whole lining membrane of the colon was closely corrugated, its rugæ becoming more and more deeply injected, until, for a space of about 9 inches from its termination, the whole presented one uniform hue of the depth and appearance of venous blood.

From the above experiments the following conclusions may be drawn regarding the iodide of iron :

1. That it acts as a local stimulant, with the power of effecting peculiar disorganization.

2. That its action is more particularly directed to the tract of the alimentary canal.

In these respects, although it may bear some faint

degree of resemblance to iodine and hydriodate of potash, yet the details are far from corresponding with much accuracy. Let us observe what relation they bear to the effects of another ferruginous compound, commonly so considered, viz., the sulphate, as these have been described by Dr Smith and Professor Gmelin.

Two dogs were destroyed, in the hands of the former toxicologist, by 3ij of sulphate of iron introduced into one of the thighs. In one of the animals, the inquirer found the stomach varied with petechiæ, the rectum black and corrugated, the liver pale, and with livid spots; in the other a large quantity of dark fluid blood was present in the stomach and smaller intestines, the rectum was red and corrugated, but without spots. When swallowed, the sulphate produced insensibility and death, and the appearances on dissection were, red spots in the stomach, dark rugæ in the small intestines, and redness of the rectum. 8 or 10 grains thrown into a vein, elicited piercing cries, followed by ineffectual attempts to evacuate the bowels.*

In the later inquiries of Gmelin, 20 grains of the sulphate proved nearly harmless when introduced into a vein.†

With a view of rendering the grounds of compa-

* Orfila, Tox. Gen. 1. 540. † Christison on Poisons, p. 602.

rison more complete, I performed the following experiment.

Experiment 16.—Forty grains of the sulphate of iron, held in solution by about 2 drachms of water, were slowly introduced into the jugular vein of a pretty large and vigorous mongrel dog. The injection was followed by violent cries and struggles; the animal on being let loose rushed round the apartment, staggered, and fell on the side; he quickly, however, rose again, and in about a minute from the beginning, passed a copious liquid stool. In a minute more, he vomited the food last taken, and together with it a quantity of frothy mucus streaked with blood, by means of great efforts and violent retching. Five or six stools took place within the next ten minutes, after which the animal betrayed no other remarkable symptom except slight depression.

To judge from the foregoing facts, the iodide of iron seems rather to affect the character of a ferruginous, than that of an iodinous compound. It certainly appears to be a more powerful agent than the sulphate; but before deciding whether this constitutes of itself a specific difference, it were well if we could ascertain what degree of allowance ought to be made for the superior solubility of the iodide. Both preparations enact the part of stimulants to

the intestinal canal; to determine their *precise* relations, otherwise than by mere hypothesis, appears to me to require much greater advancement in the state of Therapeutic science.

MEDICINAL EFFECTS OF THE IODIDE OF IRON.

The preparations of iron are in general administered in doses inversely proportioned to their respective solubility; thus, drachms of the oxide and of the carbonate, may be given under circumstances which would limit the prescription of the sulphate to grains. Opinions have varied greatly on the subject of their relative merits as therapeutic agents.

Sydenham who was so successful in the "green sickness," gave a decided preference to the filings, and was wont to scold the officious chemists for spoiling by their operations the virtues of this and other excellent remedies.* Of the same sentiments was Hoffman, as well as a number of other celebrated practitioners. Yet, in accordance with the very criterion furnished by the Hippocrates of the seventeenth century, that is to say, that we should use things as nature furnishes them, "sacra illa parente rerum nusquam non remedia disponente homi-

* Works, translated by Swan, vol. i.

ni,"* his practice was unsound, for it is very rarely that native iron has been discovered.† We have histories of the powers of metallic iron, tending to exalt it not only above its common preparations, but even higher than most articles of the materia medica; the filings said to have been efficacious in aneurism,‡ and the effect of seizing an iron bar, the instantaneous cessation of a violent fit of hysteria, yet no one would think of employing such means at the present day, any more than he would anticipate benefit from placing a thermometer under the tongue, although the consequences were once so salutary in the hands of Davy and Beddoes.§

The iodide of iron, it is scarcely necessary to repeat, was recommended for medicinal employment by Professor Anthony T. Thomson, who, in an interesting memoir,‖ wherein we are presented with details of 13 cases comprehending strumous, chlorotic, carcinomatous, and tardy syphilitic affections, has en-

* Plinius, Hist. Nat. L. xxiv.

† Neuman declares he never saw any that stood the proper tests (*Chemical Works by Lewis*), and although it is said to have been found more than once of late years, particularly in America (See Journals of Silliman, Brewster, &c.), by far the commonest form is one of combination.

‡ Bull. des se Med. ii. 250.

§ Paris's Life of Davy.

‖ Some Observations on the Preparation and Medicinal employment of the Ioduret and Hydriodate of Iron, 8vo. pp. 64. 1834.

deavoured to convince the profession of the pre-eminent virtues of this particular preparation. Its constituents are conceived to separate as it enters the circulation, so that the iodine, combined with the alkali of the blood, acts as a stimulant, while the iron as protoxide puts forth the properties of a powerful tonic.

To the ingenuity of the theory none will deny the tribute of admiration, though there may be reason to doubt the fact of iodine being nothing but a stimulant. Yet few will probably rise from the perusal of Dr Thomson's little monograph, perfectly satisfied that the presumed capabilities of the remedy have been fairly put to the test. A number of auxiliaries in the way of regimen, friction, exercise, amusements, and such like ; a regulated diet, and above all, the conjunction of other remedies, might create confusion in circumstances requiring far less delicate discrimination, than where we are called upon to determine in what measure a stimulant and a tonic mutually modify each other's effects. Five of the cases were contributions, and of the remaining eight, there were only three persons who did not receive simultaneously either iodine or the hydriodate of potash.

Mr M'Lure has offered his free testimony to the value of the iodide of iron in chlorosis, and atrophy, aided by laxatives, exercise, and an invigorating diet ;

and in phthisis, where the remedy has been recommended by Dr Thomson, it is considered by Dr Eager as advantageous, particularly in cases characterised by pallor, and a soft and flabby state of the muscles.*

I have witnessed the exhibition of this iodide in a few cases of different descriptions. The example of chlorosis about to be mentioned—the only one of the kind in which I saw it used—affords, I regret to say, an unfavourable result.

"M. Gray, æt. 19. Unmarried. The catamenia, which had previously been regular, have not appeared for a period of four months, during all which time she has been complaining of dyspnœa, palpitation, and headach. The headach is generally better about mid-day. Impulse of the heart strong, and sounds loud. P. irritable, T. moist, rather florid in the centre. B.'s confined." Leeches to the head, and laxatives having been prescribed without benefit, the patient was ordered, four days after admission, to take a grain of the iodide of iron thrice daily. The same treatment was pursued, with the addition of repeated leeching, cold applications to the head, and a valerian draught, for upwards of a fortnight, when the dose of the iodide was increased to a grain and a-half. The report taken ten days subsequently runs as follows: "Headach continues to recur at times se-

* Dublin Medical Journal, 1834.

verely, and there is on the whole little improvement. Omitt. Hyd. Ferri."*

Dr Clendinning is a strong advocate for the conjunct administration of iodine and iron, in any form that may suit the stomach, as a remedy for chronic rheumatism, unattended with febrile symptoms, but where the chief characters are debility, sallowness, emaciation, and swelling or tenderness of the joints. Flannel rollers, leeching, blistering, &c. as the occasion may demand, are likewise to be resorted to.

I had an opportunity, whilst officiating as clinical clerk in the Royal Infirmary, of seeing the iodide of iron tried in a case of this description. A young woman æt. 20, having been exposed to cold and wet early in April, was attacked with pain and tenderness in several of the joints. After undergoing a trial of most of the usual remedies for rheumatism, such as bleeding, leeching, tartarized antimony, Dover's powder, and lastly aconite, without avail, for the flesh wasted, the face assumed a pallid sickly aspect, and every thing betokened excessive weakness, while the pains in some of the joints continued severe, she was ordered to take 2 grains of the iodide in an ounce of cinnamon water, thrice daily.

Five days subsequently, both leeches and sarsapa-

* The above offers a condensed view of the case as it stands on the Journals of the Royal Infirmary.

rilla having been added in the mean time, she is reported as follows:

"*August* 8. Had a good night after the bath, but no sweating. Pain still in the left shoulder. Appetite pretty good.

Adm. hirud. vi. humero sinistro."

Again, on the

"12*th*, Pains easier. B.'s rather loose.

Sumat Pil. opii bis indies."

The patient now rapidly recovered her strength, the pains ceased, and she soon quitted the house.

M. Ricord has found the internal use of this remedy very beneficial in secondary syphilis and chronic gonorrhœa; also in chronic uterine and vaginal discharges, complicated with scrofula. On several occasions, he has used a solution of the strength of 15 grains to ℥iv. of water for the purpose of injection, with great advantage.*

On the whole, we have every reason to conclude, that the iodide of iron, but for one defect, would prove a most valuable addition to the materia medica. That defect is its easy decomposition; and, of the confusion occasioned by spontaneous chemical changes, the history of iodine affords but too many examples.

Finally, in regard to relative action, I feel much in-

* Lancet, 1836–7.

clined to look upon those features which give the character to a remedy as most prominent in the side of the iron.*

IODIDE OF LEAD.

In order to prepare the iodide of lead, we are directed to add a solution of 100 parts of hydriodate of potash to a solution of 75 parts of the acetate of lead. It is commonly described as a fine yellow powder, insoluble in cold, but perfectly soluble in boiling water, from which it is precipitated on cooling in hexagonal plates, partially soluble in alcohol and acetic acid.†

From the analysis of M. Henry (fils) in 1831, the iodide of lead is believed to consist of single atoms of its constituents.‡ Some specimens of the acetate of lead, however, throw down a greyish-yellow substance mixed with the above, which does not dis-

* The opinion of so able a physician as Dr Addison gives the writer more confidence in the accuracy of this view. Dr Addison mentioned before the Westminster Medical Society, that he "had found hydriodate of iron of great use in open scrofula, but could hardly name that among the preparations of iodine, as iron itself was so powerful a tonic."—London Med. and Surg. Journ. 1834.

† See Appendix to "Lugol on Scrofula." Some very curious observations on the changes of form effected by alternately heating and cooling the crystals, have been lately made by Mr Talbot.—Brewster's Journ. ix. 405.

‡ Jour. de Pharmacie, 1831.

solve in hot water. This is a sub-iodide, from which the other may be separated by ebullition.*

Zinc and iron decompose the iodide of lead by ebullition in water. It is also decomposed by the carbonates of soda, baryta, strontia, lime and magnesia, as well as by the simple oxides.†

PHYSIOLOGICAL ACTION OF THE IODIDE OF LEAD.

The iodide of lead applied to the cuticle produces no sensible effect; and even upon ulcerated surfaces it causes no irritation.‡

For internal use, it was at first ordered in doses of a quarter or half a grain. Such quantities were thought by Velpeau to have given rise in one instance to symptoms of digestive irritation: Dr O'Shaughnessy, however, remarks, that this occurrence must have arisen from idiosyncrasy, as ten grain doses can be borne with perfect impunity. The iodide of lead has been by many considered "by far the most interesting" of any of the medicinal compounds of iodine and the metals; and it is spoken of by Mr Pereira as "a most powerful agent."

Experiment 17.—Three drachms of iodide of lead, given to a middle-sized dog between little

* Jour. de Phar. 1835. † Ferussac's Bull. Jan. 1828.
‡ Eager, Dub. Jour. 1834.

pieces of meat, produced no immediate effect. Great depression gradually, however, supervened, and continued unabated for three days, the alvine evacuations being frequent, loose, and black. On the fourth day these symptoms began to wear away; and, by the lapse of the seventh, the animal apparently enjoyed its usual health.

Experiment 18.—Forty grains of iodide of lead having been given to a rabbit, the animal died in the space of twelve days. For the first five days the bowels were torpid. The stool then evacuated contained both lead and iodine. There were no other signs worthy of note but those of slowly increasing weakness, and a copious soft evacuation immediately previous to death.

The stomach and intestines appeared remarkably contracted and scantily filled; the lining membrane of the stomach red, especially opposite the cardiac orifice, and marked with a few small and deeply-seated ecchymosed spots.

Experiment 19.—A bull-dog of the common stature, but no great activity, took five grains of the iodide of lead morning and evening for five days, without any perceptible derangement as to health. On the three following days he received two

drachms in divided doses, and the day after, a drachm morning and evening. On the twelfth day, ℥ij. were given at one dose, but the animal continued on the day following to manifest a tolerable appetite, and was perfectly able to walk, although unwilling to be disturbed. The dose was now increased to half an ounce, yet with little effect till the third day subsequently, when the animal for the first time rejected nutriment, and persevered in keeping the recumbent posture. In three days more, or eighteen days from the commencement, life became extinct; the effect of not less than ten drachms and fifty grains of the iodide of lead. The most remarkable symptom in this instance was the extreme unfrequency of the intestinal evacuations, which were scarcely more than three or four times observed.

On *inspection*, the muscles were found lean and flabby, the abdominal parietes arched, the small intestine vascular, contracted, and containing nothing but grey pultaceous mucus in small quantity, its colour grey in the interior, and striated longitudinally with dotted vascularity. No appearance of ulceration. The stomach, partly filled with half digested meat, was flaccid, and had its inner coat moderately injected; towards the pylorus a multitude of small, light, blackish-grey spots presented themselves, which might have been taken for ulcers, but

that on close inspection, they exhibited the normal porous structure. Many particles of the yellow iodide were scattered over the surface.

The liver was of the natural colour, but both this organ and the spleen were atrophied, as was supposed, to scarcely half the natural bulk. There was no alteration observed in the brain and spinal cord. Blood fluid, but coloured as usual. Unluckily from not seeing the animal for several hours about the period of death, I am unable to say what symptoms were the immediate precursors of this event.

MEDICINAL EFFECTS OF THE IODIDE OF LEAD.

MM. Cottereau and De Lisle are the individuals to whom we owe the introduction of this medicine, chiefly on the ground of its not occasioning cutaneous irritation like iodine and hydriodate of potash.* It may perhaps be a question how far the *want* of energy should constitute a recommendation.

M. Velpeau treated three cases of enlarged glands at La Pitié with very gratifying success, although the patients had used friction with other preparations of iodine to no purpose; two of them before admission.† The same happy results took place at the Hôpital des Enfans, under the directions of M.

* Gazette des Hôpitaux, 1831.

† See Dr O'Shaughnessy's Appendix to 'Lugol on Scrofula.'

Guersent. After three weeks' use of the hydriodate of potash, in a case of enlarged cervical and mesenteric glands, Dr Roots applied the iodide of lead ointment to the former with a great deal of benefit.

A man labouring under a leprous eruption extending over the whole body, being about to leave the infirmary "incurable," I requested him to apply the iodide of lead ointment to the extremities of one side only. On his return in a week to shew himself, the scales upon the part in question were brown and greatly softened; the disease elsewhere remained stationary. The next time I saw him was several days afterwards; he had finished the ointment for two or three days, and the whole eruption was now as bad as ever. In order to estimate what share of the benefit had been due simply to an unctuous application, conjoined with air and exercise, I furnished him with a box of the same ointment for one side, and one of simple cerate for the other. He was obliged, however, to leave suddenly for the country, so that I have not seen the issue of the experiment, but I am told that the malady had nowhere undergone much improvement.

On the subject of the cases above quoted, there is some difficulty in separating the effects of the iodide of lead, from those of the precursory and accompanying remedies. To judge from the facts with

which writers have furnished us, one would scarcely be induced to think this substance very energetic.

The relative effects of the iodide of lead, will indicate to those familiar with the other compounds of the same base, that the electro-positive constituent is the one that predominates. So at least I infer from the nature of the operation on the bowels, the tardy and peculiar structural lesion of these organs, lessened in capacity and empty, yet without breach of continuity, and the general atrophy of the system.* But indeed, we have not sufficient knowledge of the carbonate, or the acetate of lead, to recognise every feature in their effects, and understand why these should sometimes vary ; so that anything further than a general hint is, perhaps, more than should be expected in the present instance.†

* See Christison on Poisons, Art. Lead.

† I have to regret, that relying on the poison having been prepared with the nitrate of lead, I was not personally at the pains of ascertaining its solubility in the instance of the last portion administered in experiment 19.

I have reason to believe that it contained a proportion of the insoluble constituent. The recent labours of M. Fremy (Jour. de Phar. 1835) point to the nitrate, in preference to the acetate of lead, as the proper material for making the preparation ; the acetate became sesquibasic by exposure to air, and when mixed with the solution of hydriodate of potash threw down insoluble oxyiodides as well as the substance soluble in hot water, which is a Proto-iodide. By adding a little acetic acid, however, the whole may be rendered soluble. The Proto-iodide dissolves in 1235 parts of cold, and in 194 parts of boiling water.

IODIDE OF ZINC.

Gay Lussac first obtained this compound by the method which is still usually followed, viz., boiling together iodine and zinc in atomic proportions, or with rather an excess of zinc, in a flask of water, down to dryness, and subliming the residue. Iodide of zinc was thus procured in beautiful colourless prismatic crystals.*

The iodide of zinc is a very deliquescent substance, and cannot be easily retained in the solid form. Heated in open vessels, it resolves itself into iodine, and oxide of zinc. Digested along with iodine in concentrated solution, it forms a *biniodide* of zinc.† It has the property of precipitating milk and the white of egg. It is very liable to undergo spontaneous decomposition.

PHYSIOLOGICAL ACTION OF THE IODIDE OF ZINC.

The iodide of zinc has an exceedingly caustic taste, and if applied to a broken surface, gives rise to considerable smarting. In order to arrive at a more full appreciation of its effects upon the animal economy,

* Ann. de Chim. xci. † Berzelius, Traité de Chimie, iv.

I made the experiments which are about to be mentioned.

Experiment 20.—Three drachms of crystallized iodide of zinc, were administered to a terrier dog, disguised by meat cut into slices. The substance however deliquesced, and exuded through the covering so speedily, that it had scarcely entered the stomach before being rejected, and for several minutes afterwards the taste of it seemed to be a source of much annoyance to the animal.

Experiment 21.—At one o'clock P. M. a drachm of the iodide of zinc, dissolved in two drachms of water, was introduced by means of an elastic tube into the stomach of a strong rabbit. For a minute or two after the withdrawing of the instrument, the animal did not attempt to stir; it then began to move in a slow and dejected manner, around the apartment. After about two hours, each respiration was attended with an abrupt purring noise; the bowels and bladder were at the same time emptied. During the earlier part of the following day, the animal continued resting on its haunches; but gradually becoming more and more enfeebled, it laid itself down on the side about noon, and expired.

The stomach was found perfectly flaccid, and the lining membrane of the organ studded with miliary eminences, stretching from the œsophageal opening for about an inch in the direction of the greater curvature. These little bodies varied in tint, some being orange-white, others arterial-red, and those on the anterior wall of a deep blackish-grey ; these last insensibly became lost in a space of nearly two inches in length and an inch broad, where, besides presenting the same altered hue, the organ was hardened, and deprived of its villous covering. An elevated membranous border, smooth at the junction, but soon terminating in a ragged edge, and in some places translucent, in others white and opaque, formed the limit of the spot just described. The remainder of the organ shewed an exalted state of diffused vascularity, and a considerable diminution of calibre was apparent in the intestines. The lower lobes of the lungs were remarkably œdematous.

A dissimilarity between the poisonous effects of iodide of zinc, and those of either iodine or any of its other compounds which we have hitherto examined, is very readily perceived. To none can it at all be compared, if we except the iodide of iron, and it will presently be shewn that its relation to this substance is separated by a tolerably distinct line of demarcation.

What follows will, in the mean while, afford some idea of the connexion between the iodide and the other compounds of zinc, in point of physiological effects.

Orfila introduced seven drachms and a-half of the *sulphate* of zinc, into the stomach of a dog, and put a ligature upon the gullet. He observes, that in ten minutes, the animal made efforts to vomit, which were followed by liquid stools, and in the course of four hours, by uneasy respiration, on the second day betrayed notable signs of depression, and on the night of the third day breathed his last. Orfila found the stomach inflamed, and varied with bloody effusions ; the lungs preternaturally dark, and devoid of crepitation. In experiments where death was the consequence of introducing the pulverised salt into the cellular tissue, the same author observes in reference to the stomach, " on decouvre souvent un nombre variable de petites ulcerations ronds, a fond noir, entourées d'une aréole blanchâtre, surtout vers le pylore."* The lesions just described display a difference rather of degree than of character, from those which were remarked in the same organ in experiment 21.

In a case of poisoning with the sulphate of zinc, quoted by Dr Christison, the observer found "the stomach and intestines, but particularly the intestines,

* Toxicol. generale.

contracted, the inner membrane of the stomach greyish-green, with several spots of effused blood, and greenish fluid contents, the inner membrane of the small intestines similarly spotted."

The method of venous injection, which we have hitherto found to draw out the most distinguishing traits of action, in the instances where it was had recourse to, will be perceived to disfavour the idea of any close analogy existing between the physiological properties of the iodides of iron and zinc.

Experiment 22.—The femoral vein of a large shepherd's dog having been opened high in the thigh, thirty grains of the iodide of zinc dissolved in a drachm of water were very slowly introduced. In two or three seconds the animal was violently affected, threw forward the head, and emitted three or four piercing cries, at the same time that the respiration laboured strongly, the whole muscles of the body fell into quick and irregular convulsions, and the urine was forcibly ejected. These phenomena were of brief duration, for before the lapse of a minute and a-half they had subsided, and the body was motionless.

In about five minutes more the cavity of the chest was laid open. The voluntary muscles contracted with considerable energy when cut into, and the heart,

although at first quiescent, no sooner had an incision made into one of its cavities than it also contracted, forcibly relieving itself of its contents, which were perfectly fluid. The lungs did not appear discoloured or congested. On exposing the abdominal viscera, the peristaltic motion of the intestines was observed to be still going on, but these organs presented no abnormal appearance.

Experiment 23.—Twenty grains of the iodide of zinc were slowly injected into the jugular vein of a large bitch of the wolf-dog variety. The phenomena produced were in every respect essentially similar to those described in the preceding experiment. A remark which applies to both is, that the pupils of the eyes were exceedingly dilated.

The effects observed in the two experiments just related, might be supposed to indicate a resemblance between the iodide of zinc, and the iodide of potassium, in their relation to the animal economy. But, again, the caustic taste and the local action on the skin and the stomach, of the former, prohibit such a view as this from being adopted. The iodide of iron is sufficiently distinguished, when thrown into the circulation, by its comparative slowness of action, and by having a peculiar tendency to inflame the bowels.

Forty-eight grains of the sulphate of zinc, thrown by Orfila into a vein, killed a dog instantaneously, and half the quantity produced death in three minutes. A drachm of the same salt, introduced by myself into the jugular vein of a stout dog, proved immediately fatal. These effects seem to correspond with those of the iodide.

MEDICINAL EFFECTS OF THE IODIDE OF ZINC.

Almost the only individual that, so far as I am aware, has made any observations regarding the therapeutic merits of this compound, is Dr Ure, who affirms that he has found it a powerful external remedy in scrofulous and goitrous enlargements.* There is reason to regret that this well-known chemist has left us in obscurity, with reference to the mode in which its power was manifested.

In the United States it has been used to form an *astringent* injection, in the proportion of a grain to an ounce of water.†

To draw a conclusion from the preceding statements. The properties of a zincic rather than those of an iodic compound, if these terms be allowable,

* Dictionary of Chemistry, 2d ed. p. 516.

† United States Dispensatory.

seem to be displayed in the effects which the iodide of zinc produces upon the animal system. To determine whether the iodine modifies in any special and appropriate manner the influence of the zinc; or whether it may not simply be instrumental in carrying into execution the demands of a law "to which, hitherto, no undoubted exception has been found,"* by imparting solubility to the efficient element, is a problem not likely to be very speedily solved.

The properties of the iodide of zinc may be thought to resemble those of the chloride, as observed by Dr Canquoin and Dr Alexander Ure.†

IODIDES OF MERCURY.

The iodides of mercury that have been used in medicine are two in number, one of which is regarded as consisting of equal atoms of its constituents, while in the other, the iodine bears to the mercury the proportion of 2 : : 1.

* Christison on Poisons. † Med. Gazette, 1836.

PROTO-IODIDE OF MERCURY.

The biniodide appears to be a sufficiently uniform and stable compound, which, from whatever cause, is more than can be said of its fellow. M. Henry, in his papers in the Journal de Pharmacie in 1822 and 1827, characterises the latter as a yellowish-green powder, and the same epithet is adopted by Edwards and Vavasseur,* Merat and De Lens,† and other writers, as properly descriptive of the colour. On the other hand, Dr Turner, in the fourth edition of his chemistry, and Dr O'Shaughnessy,‡ say, that the colour of the powder is a fine yellow.

Three mercurial iodides, however, are now known to chemists; according to Berzelius, the green or proto-iodide, the yellow or sesqui-iodide, and the red or biniodide.§ If the materials for preparing the first of these be not carefully freed from the presence of any per-salt of mercury, the second, which may be regarded either as a sesqui-compound, or as a combination of the biniodide with the proto-iodide (mercurio-iodide of iodide of mercury) will be the product.

* Materia Medica, translated by Davies, p. 256.

† Dictionnaire de Mat. Med.

‡ Appendix to 'Lugol on Scrofula.

§ Traité de Chimie, vol. iv.

What will farther illustrate the difficulty of coming to any conclusion from what authors have told us of the effects of the proto-iodide, M. Lugol ascribes to the ointment made with it a canary-yellow colour, though he says it sometimes presents a "*dead green*" tint, from the presence of some protoxide of the metal, and sometimes an "*orange-yellow*," from an admixture of biniodide; yet Mr Pereira (Medical Gazette) indicates the green iodide as the one that has been employed in medicine.*

It is well to be aware of these chemical discrepancies, inasmuch as the effects of this substance, as employed in medicine, have sometimes been known to vary unaccountably.

Berzelius recommends for preparing the *proto-iodide* of mercury, to add a solution of the proto-nitrate of this base, to a solution of the iodide of potassium. It is a *green* powder, subliming unchanged when rapidly heated; the colour deepens under the influence of solar light, and changes to red if a slow heat be applied. Water does not act upon it, but it dissolves slightly in iodide of potassium.†

* Of two specimens sold under the name of proto-iodide, at two of the principal shops in this city (five others at which I inquired not keeping any on hand), one was of a dull yellowish-green, the other of a canary-yellow colour.

† Berthemot recommends to rub together the constituents in suitable equivalents, but the labour of this process, and the liability of the iodine to volatilize by the heat of friction, are strong objections in the way of its adoption.

The *sesqui-iodide*, or yellow powder, forms when the proto-nitrate contains an admixture of the per-nitrate of mercury. Any per-iodide that may have fallen, may be removed by digestion in a solution of chloride of sodium.

Having alluded to these sources of difference, I shall, in citing the practical experience of authors, avoid any farther pharmaceutic criticism, leaving it to the reader to devise his own explanation of the non-correspondence of facts. It would have been more desirable to have inquired minutely into the relations, both chemical and practical, of the medicine; but I regret the less having been prevented in this by the extent of the subject, that the ability and zeal which have latterly been directed to the investigation of iodine are not likely to let any known gap long remain open. For my own experiments I used the yellow iodide, supposing this to be the article in ordinary use.

PHYSIOLOGICAL ACTION OF THE PROTO-IODIDE OF MERCURY.

From various passages in authors, we may infer that this substance commonly makes very little sensible impression when applied to the *cutis*, whether in a sound or in a diseased state. Thus, Rayer has

nearly banished it from his prescriptions, reposing more faith in the virtues of the binary compound ;* and Lugol seems to intimate, that ulcerated surfaces were very little excited by its application.†

Dr Epps having ordered an ointment of the "iodide of mercury" to be applied to a scrotal tumour, (in the proportion of ℥j. to ʒj.,) states, that the patient found fault with it for being inert ; but, on the same prescription being sent to a different chemist, an ointment was received of the most irritating properties. The first was of a *yellowish-green*, the other of a *bright red* colour.‡

On the other hand, Dr Eager asserts, that both the iodides produce a feeling of pricking on the surface ; and it is allowed by M. Lugol, that sometimes, though rarely, the pain excited by the proto-iodide in question was not inferior to that occasioned by iodine itself.§

The consideration of the *internal* effects of a mercurial compound naturally begins with the inquiry, whether it be capable of inducing *ptyalism*. In the present instance, the doses ventured upon have been in general so small, that, if such a result has not fre-

* On Diseases of the Skin. † On Scrofula, p. 107.

‡ Lancet, 1832–3, vol. ii.

§ Dub. Jour. of Med. Soc. 1832–3, vol. ii.

quently been remarked, this circumstance alone will obviate any decided inference in the negative.

However, of four patients to whom M. Biett administered it in the quantity of two grains daily, two were readily salivated; but, with reference to the others, the author is silent on the subject.* Salivation is ascribed by Lugol to his mineral water, in a case where it may be a question whether this iodide, long applied to an ulcer, was not more properly the cause.

In order to draw a wider estimate of its influence over the body, it was necessary again to have recourse to experiment.

Experiment 25.—A drachm of the yellow iodide of mercury was administered along with the food to a pointer dog, at four in the afternoon. The consequences were vomiting, with black semifluid alvine evacuations in the course of the night; glassiness of the eyes, and a thick ropy discharge from the nostrils by the third day; and about the close of the fifth day prostration, and regular slow motion of the extremities to and fro at each respiration. On the succeeding night the animal died. Up to the last day he was able to stand, shewed no want of appetite, and had not suffered any perceptible sensorial derangement.

* Lancette Francaise, Juin. 1831.

Dissection exposed to view a half decolorized coagulum in the left ventricle of the heart, and a little dark semifluid blood on the other side of the organ, strong prominent corrugation of the lining membrane of the stomach, with redness of the apices of the rugæ, dotted red patches on the sides, and a string of extravasated blood in every intervening furrow.

Experiment 26.—A scruple of the yellow iodide of mercury was given to a strong male rabbit at nine in the morning. In a few hours the animal voided a copious semifluid stool, the day following he was affected with tremors and debility, and gave utterance to low plaintive cries, in the course of the night succeeding which, death took place. Shortly before this event, the animal passed a scanty semifluid evacuation.

The lining membrane of the stomach was excessively injected about an inch from the pyloric orifice, and presented a small quantity of extravasated blood upon its surface. Its contents were soft blackish-green and homogeneous, as were those of the small intestines. The rectum and bladder were empty.

From the foregoing accounts, this compound of iodine would appear to be an irritant of no inconsiderable energy.

MEDICINAL EFFECTS OF THE PROTO-IODIDE OF MERCURY.

It is principally from being employed in venereal affections, implicating the cutaneous tissue, that this substance derives its title of a medicine. The hint which led to its adoption was thrown out by Dr Coindet, who suggested that syphilis occurring in scrofulous habits, would probably be best combated by a remedy thus constituted with regard to the specific virtues of its components. M. Biett was the first to carry the speculation into practice, and his results have been thought to afford it confirmation. He employed the drug both internally, and in the form of ointment.* M. Breschet, however, found it useless in comparison with the biniodide, in a case of carcinomatous ulceration at the greater angle of the eye,† and we have already mentioned M. Rayer's conclusion, with regard to the respective merits of these two preparations.

BINIODIDE OF MERCURY.

This compound precipitates in the form of a scarlet powder, when we add a solution of seventy parts of corrosive sublimate to a solution of a

* See Cazenave et Schedel; Maladies de la peau.

† Lancette Francaise, Juin 1831.

hundred parts of iodide of potassium. Being itself soluble in either of these solutions, it is liable to be partly lost unless attention be paid to the proportions.

Exposed to heat it melts, and sublimes in rhomboidal plates. It dissolves, as above stated, in hydriodate of potash and corrosive sublimate; also in alcohol, ether, and muriatic acid, but not in water or sulphuric or nitric acid, unless they are highly concentrated.* It gives rise to an opacity when presented to a solution of albumen.†

PHYSIOLOGICAL ACTION OF THE BINIODIDE OF MERCURY.

However authors may vary in their sentiments regarding the previous preparation, all parties seem agreed that the form we are now considering is endowed with considerable powers of producing irritation. Thus, M. Lugol considers it nearly as escharotic as the corrosive sublimate,‡ and to the same purport may be adduced the testimony of the authors shortly above cited. It is said to enjoy the power of producing salivation,§ of which fact, although it is probable, I am not acquainted with any

* Jour. de Pharmacie, 1822.

† The powder formed by the precipitated iodide is so delicate as to pass through most kinds of filtering paper. It adheres with obstinacy to the villous coat of the intestine, especially when dry.

‡ On Scrofula, p. 170. § Edwards and Varasseur.

specific example. The patient to whom Dr Epps referred, asserted that he felt the taste of it in his mouth, on the day after rubbing the ointment on the tumour of the scrotum.

Experiment 27.—A strong male rabbit took, at eight o'clock in the morning, a scruple of biniodide of mercury, along with its food. In the progress of the day, the animal gradually became much enfeebled, evacuating the contents of the bowels, and on the following morning life was found extinct.

On examination, the inner surface of the stomach was seen occupied, for about the space of an inch near the pyloric orifice, by some of the poison mixed with vegetable matter, which mere washing with cold water would not remove, while the immediate neighbourhood presented a crowd of minute yellowish elevations. The general surface of the inner membrane was preternaturally reddened.

Experiment 28.—Ten grains of biniodide of mercury were dissolved in half an ounce of water containing a scruple of hydriodate of potash, and the whole of the fluid was administered to a large young Newfoundland dog. The animal manifested strong dislike to the taste, and in four or five minutes vomited a quantity of thick frothy mucus, with violent

retching, which was repeated about four times within the hour, the last matter brought up exhibiting streaks of blood. During this time great uneasiness was indicated by constant changes from the standing to the lying posture, and the reverse; and after several attempts to relieve the bowels, the animal succeeded in about half an hour in evacuating a loose scanty stool. The whole of the following day was spent in a state of marked depression, after which he began to take nourishment, and in four or five days seemed to be not at all under the influence of the poison.

I was struck after noting down these remarks, on recurring to Dr Mead's account of the effects produced on a dog by corrosive sublimate, with the similarity of features which the two descriptions exhibit.

"To a large dog was given a drachm of *mercury sublimate*, mixed with a little bread. Within a quarter of an hour he fell into terrible vomitings, casting up frequently a viscid frothy mucus, every time more and more bloody, and purged the same downward, till, tired and spent with this hard service, he lay down quietly as it were to sleep, but died the next morning."*

A similar fluid having been administered to a

* A Mechanical Account of Poisons, &c., by Richard Mead, M. D., 1756.

hedgehog, killed it almost immediately, and on examination, combined iodine was detected in diffusion throughout the brain, the spinal cord, and other textures. A small terrier dog was made to swallow the drug, in doses varying from four to sixteen grains, inclosed in little paper cones, but the stomach almost invariably rejected a larger quantity than the first. The effect of this was the production of frequent black semifluid alvine evacuations.

MEDICINAL EFFECTS OF THE BINIODIDE OF MERCURY.

Of these it is not requisite to say more than what has been already sufficiently stated, viz., that they have been thought to surpass those of the protoiodide in energy; both of the compounds having been used in the same diseases.

Advantage has been derived from conjoining iodine or hydriodate of potash with mercury, as separate ingredients in the same prescription. The eminent Professor to whose kindness I stand so much indebted, informs me of his having found considerable advantage from using the mixed ointments of mercury and hydriodate of potash in chronic hepatitis, a plan adopted at the recommendation of Sir James Leighton, who had practised it successfully in the Russian hospitals. This combination has always acted with more rapidity than mercury alone, with not so much danger of violently affecting the constitution.

To give a brief general summary of the inferences to which the foregoing facts appear to lead. I should feel inclined to conclude—

1. That iodine and hydriodate of potash, act very much in the same way, but that there is still a difference, not merely in point of power, but of specific properties.

2. That whatever be the *proper* action of the iodide of sulphur, its facility of decomposition gives it a resemblance to iodine.

3. That the iodides of carbon, *so far as examined*, have an action peculiar to themselves.

4. That in those metallic iodides which were submitted to examination, the preponderance of power is on the side of the bases.

The overthrow of previous impressions of a contrary tendency, is not unfrequently urged as the surest test of the validity of particular doctrines. No criterion can be more favourable to the opinions which the writer entertains at present, for setting out with certain preconceived notions derived from reading (of which it is scarcely possible for an inquirer that knows any thing of his subject entirely to divest himself),* he certainly anticipated a very dif-

* On the subject of hypothesis, which appears to be in very ill odour with the medical men of the present day, although more

ferent result. How could it be pre-supposed that the most electro-positive body known in nature, united to an element almost at the other extremity of the scale, should exercise less modifying influence over its properties, than substances of much nearer approximation to it in this particular?

Perhaps the following quotation from Berzelius, which, it is only proper to mention, the writer had not in his recollection at the time of making his observations, may afford some assistance, if not in explaining the *rationale* of the rules above laid down, at all events in reconciling the understanding to the possibility of their being founded in nature. Debating what arrangement of salts he shall adopt, this profound chemist remarks :—" Plusieurs auteurs ont rangé les sels d'après les acides, d'autres d'après les bases ; peu importe dans quel ordre on étudie les sels alcalins ; les sels terreux, au contraire, et surtout les sels à oxides metalliques proprement dits, sont plutôt caractérisés par la base que par l'acide ; je les rangerai donc d'après la base." (Traité de Chimie, vol. iii.)

than one example of it has just fallen under our notice, it is instructive to know the opinion of a man like Humboldt, who has seen much, and deeply studied the progress of events. " Quel'que soit le motif, tout ce qui excite au mouvement, soit erreur, soit prevision vague et instinctive, conduit à étendre la sphère des idées, à ouvrir de nouvelles voies au pouvoir de l'intelligence." (Examen critique de l'Historie du Nouveau Continent, par A. de Humboldt, 1836.)

APPENDIX.

APPENDIX.

Letter A. (Note p. 8.)

This writer is very particular in giving directions how to prepare and preserve the *burnt sponge*, so as to ensure its greatest degree of activity, and the facts mentioned in the text shew the propriety of his precautions, notwithstanding that succeeding writers seem to have very generally overlooked them. The medicine was to be given combined with other ingredients, in the form of powder, according to the following prescription :—℞ Spongiæ marinæ, paleæ maximæ ossis sepiæ, piperis longi et nigri, zinxi, cinamomi, salisgemmæ, piretri boni, gallarum, spinæ rosarum omnium, ana ℥ij ; hæc omnia pulverisentur, exceptâ spongiâ marinâ et paleâ, quæ debent comburi, et cinis ex eis factus cum prædictis debet admisceri, &c. This was to be kept in a wooden box or leathern bag, " ne virtus ejus exhalet." He continues, " Et ideo melius est si fiat iste pulvis *in parva quantitate et recens*, quia fortioris erit virtutis." Prior to the process of burning, there was to be no washing, he says, with soft water ; the sponge ought merely to be dried in the sun, in order that any foreign matter being rendered friable, might be more easily expelled. Troches or pills, were another form in which it was prescribed.

Regarding the efficacy of the burnt sponge in bronchocele, Arnoldus speaks in terms of unmeasured praise. Nothing can

be more striking than the account of the origin of his treatment. " Hasce pilulas, et pulverem suprascriptum, extraxi a quodam libro secretissimo magistri mei, quem chariorem omnibus aliis libris reputabat."

Letter B. (Note p. 15.)

The writer had begun some chemical experiments, with the object of determining with precision the action of iodine upon water, when circumstances led him to become acquainted with Mr George Wilson, who had already made some ingenious researches on the same subject. The pressure of various avocations created great willingness to resign the task, particularly as this gentleman's mode of proceeding seemed not unlikely to prove successful. Hitherto (and it adds another to the numerous examples of difficulty in the way of learning the properties of iodine), the results obtained do not carry us to the conclusion we are in quest of; nevertheless, in the course of the inquiry, some facts have come out which the chemical reader will perhaps not deem unworthy of his attention.

" The curious discovery made by Berthollet, that an aqueous solution of chlorine, when exposed to sunlight, is decomposed with the evolution of oxygen, naturally led the first observers of the various analogies between chlorine and iodine, to expect in the latter a similar power of decomposing water.

" Although no experiments have been recorded as performed to determine this point, two very opposite opinions have been stated by chemists of acknowledged celebrity, Dr T. Thomson declaring, that water is not decomposed by iodine,* while Mr Brande invests it with more powerful affinities than chlorine, mentioning that a solution of iodine gives out no oxygen by exposure to sunshine, but slowly loses its colour, giving rise to the formation of iodic and hydriodic acid.†

* System of Chemistry, vol. i. p. 112.

† Manual of Chemistry, p. 341.

" Having had occasion, during the months of May and June 1837, to carry on a series of experiments on the influence of sunlight on solutions of iodine, I obtained results in many respects very different from the statements of both these gentlemen.

" Phials of different sizes, filled with a saturated solution of iodine in water, and inverted in vessels containing a similar solution, were exposed to sunlight for periods varying in proportion to the quantity of fluid under observation, and the intensity of the light to which it was exposed.

" These solutions, in conformity with Mr Brande's statement, slowly became colourless, but with an attendant phenomenon of which he has made no mention, although I have found it invariable; after two or three hours exposure to sunshine, and before the solution had perceptibly altered in tint, minute bubbles of gas were seen to separate from the fluid, attaching themselves to the sides of the vessel, till gradually increasing in size, they acquired considerable magnitude, and rising to the top, formed one large bubble; a distinct paleness in tint was seen to succeed this evolution of gas, but both these phenomena ceased on the removal of sunlight. On a fresh exposure to the solar rays for two or three hours, these were again observed, and so on for several days, the enlargement of the bubble of gas, and the decoloration of the solution keeping pace, till the fluid became quite colourless, when all evolutions of gas ceased.

" These changes took place, in solutions of iodine, both in spring water and in distilled water, provided the latter was agitated with air before making the solution, so as to restore the gas lost during ebullition, and prevent it absorbing the gas evolved.

" The decolorized solution was transparent and tasteless, but slowly reddened litmus paper, the addition of starch produced no change, but it was at once decomposed by sulphuric nitric, or iodic acids, with the liberation of iodine, manifesting all the properties of a very dilute solution of hydriodic acid.

But Mr Brande states the solution to contain iodic acid, without, however, mentioning the method he adopted to ascertain this. On adding a drop of a strong solution of hydriodic acid, no change ensued, although this acid can detect a very minute portion of iodic acid. The only delicate test which chemistry at present affords us to determine the presence of this acid, pure morphia, produced no effect when added to the solution, either as at first procured, or after it had been concentrated to a thirtieth of its original bulk. Moreover, we know that iodic and hydriodic acids are incompatible in the same fluid, unless in states of great dilution, where the mechanical separation of their component particles prevents their chemical affinities from coming into play, but concentration will overcome this difficulty, and by bringing the two acids within the sphere of their mutual action, cause the decomposition of both with the liberation of iodine, which may be detected by its appropriate test; but a portion of the decolorized solution, concentrated by distillation to a fortieth of its original bulk, suffered no decomposition, the fluid in the receiver containing no iodine in any state of combination, while that in the retort contained no free iodine, but was decomposed by the oxyacids, manifesting the same properties as before, only in a more marked degree. As the same results were obtained by the repeated trial of these experiments, the conclusion seems unavoidable, that the decolorized solution contains no iodic acid.

"The analogy of chlorine, and the absence of a compound of iodine and oxygen, led to the anticipation that the gas would prove, on analysis, to be pure oxygen, but on adding to it an equal quantity of nitric oxide, absorption took place only to a half, and the same result was obtained from repeated experiments, but the difficulty of measuring small portions of gas is so great, and the adjustment of small bubbles of deutoxide of nitrogen to the exact dimensions of those of the gas about to be tested, a task of such nicety, that only an approximation to truth could be procured, and the results obtained did not deserve implicit confidence. In these circumstances, the inquiry

was abandoned till it could be repeated with more ease, and with large quantities of the iodine solution. Meanwhile, whether the gas shall prove on future analysis to be pure oxygen, or merely the air dissolved in the solution, and separated from it when the iodine and hydrogen combined, or a mixture of both, it is equally a new and a curious fact, that when iodine decomposes water, it only combines with its hydrogen, while, at the same time, a gas is invariably evolved."

Letter C. (See p. 74.)

My Dear Sir,

It is now about two years since I proposed to my colleagues at the Eye Dispensary, Dr J. A. Robertson and Dr F. Farquharson, to make trial of the therapeutic properties of iodine in certain diseases of the eye. As they assented to the proposal the experiment was immediately set on foot.

The cases selected were—

1. Obstinate ophthalmia tarsi.
2. Strumous sclerotitis.
3. Strumous chronic ulceration of the cornea.

The forms in which the iodine was employed were—

1. Solutions of iodine and hydriodate of potash in water, of three different strengths, as recommended by Lugol. Appendix, Nos. 1, 2, 3.
2. A concentrated solution of iodine and hydriodate of potash in water. Appendix, No. 4.
3. Hydriodate of potash rubbed up into an ointment with lard. Nos. 5 and 6.
4. Ointment of iodide of lead. No. 7.

I. In all the cases of *ophthalmia tarsi*, the iodine was employed externally. The ioduretted *collyria*, Nos. 1, 2, 3, were found of very little service in the slighter forms of this affection, and much less efficacious than sulphate of zinc or satur-

nine washes. In those very obstinate forms of the disease in which the apertures of the meibomean glands are nearly or altogether obliterated, where the eyelid is partially everted and its lining membrane in a hypertrophied or very much altered condition, so as to partake in some measure of the properties of the skin, the washes Nos. 1, 2, 3, were totally useless. In a number of such cases, the strong solution No. 4 was applied with a pencil to the lining membrane of the lid; it acted as an escharotic and caused much irritation; but although after the inflammation so excited, the state of the eyelid was improved, still the improvement was neither so marked, so speedy, or so certain, as after the employment of other escharotics, particularly the nitrate of silver and sulphate of copper. After a trial in seven or eight cases, it was therefore condemned as of little use.

The *ointments* of hydriodate of potash and of iodide of lead were found nearly as inefficacious. Those of hydriodate of potash caused much irritation, that of iodide of lead much less, and the latter in many cases effected a cure, but certainly not more speedily or effectually than ung. hyd. nit. mit. or oxydi hyd. rubri; and, consequently, after a fair trial it was given up. In no case of ophthalmia tarsi was iodine or any of its preparations given internally.

II. In strumous sclerotitis, iodine was employed internally, never locally. The cases selected were of an obstinate character, occurring in children where scarifications, leeching, blistering, laxatives, &c. had been unsuccessfully had recourse to in the first instance,—cases quite unfitted for local stimuli. The form employed was the strong solution No. 4, in doses from two to six drops twice a-day; along with this strict attention was paid to the state of the bowels; exercise, sea-bathing, salt-water baths, and a dry plain diet were recommended. Perhaps the first cases selected for this treatment were not well suited for it; but after a trial for about a month, in twelve or fourteen cases, its farther use was discontinued. In one or two cases

the patient seemed to be improved by it, but in others the medicine did harm, causing irritation and sickness of stomach, and considerable debility ; and certainly its powers in chronic strumous sclerotitis are never to be compared with those of other tonics, more particularly the Calumba root, combined with soda and rhubarb, and the sulphate of quina, which last remedy I consider quite invaluable in such cases.

III. The cases of chronic strumous ulceration of the cornea, in which iodine was employed, were of two kinds.

First, Very chronic, diffused, and patchy superficial ulceration, with a degree of vascularity, the vessels being principally conjunctival, and frequently passing in several bundles over the cornea to the ulcerated surfaces.

Secondly, Deep indolent solitary ulcers of the cornea, with rounded callous edges, with no attendant vascularity of any of the tunics of the eyeball.

The characters common to these two classes were then, *obstinacy* after the employment of antiphlogistic means and the removal of all local causes of irritation on which they might depend, and above all, their irritability when treated with the gentlest stimulants. Although perfectly chronic, and incapable of being benefitted by the farther use of antiphlogistic measures, they possessed such a susceptibility to inflammatory action, that the moment an attempt was made to heal them by any of the ordinary mild collyria, such as nitrate of silver, sulphate of copper, or acetate of lead, great inflammation was excited ; the acute stage was brought on again, and after some time, and the use of blisters, leeches, &c. the disease was found to be *in statu quo*. In such cases, of daily occurrence at an Eye Dispensary, and productive of much annoyance, iodine was used as a collyrium. The solutions No. 2 and 3, weak as they appear, were found to be rather irritating. No. 3, in particular, is so irritating, that it was soon laid aside ; and No. 2, though less powerful, was found of most service after No. 1 had been em-

ployed for a considerable time, and the disposition to vascular action was much diminished.

The solution, No. 1, is certainly a most valuable adjunct to the Materia Medica Ophthalmiatrica; though, from the little success that had attended the use of iodine in almost any of the other forms, both my colleagues, Dr Robertson and Dr Farquharson, felt a little prejudiced against it, experience soon convinced us that in this particular instance an exception must be made in its favour. The very best effects have resulted from the employment of the weak iodine wash, No. 1, in obstinate and irritable ulceration of the cornea, and whilst all the other preparations have gradually disappeared from the table to the shelves of the Eye Dispensary, this particular preparation has been and is still very much used. I cannot at the present moment say, not having the Dispensary Record-book at hand, in how many cases it has been used, but some idea of the number may be formed when I say that, during the last two years, eight pounds (of 12 ounces) of this solution have been employed, each patient using on an average four drachms during the process of cure.

A drop is put between the eyelids twice a day at first, and after a week or ten days it is employed three times a day.

In some cases where the susceptibility to high vascular action is very great, even No. 1 proves too irritating at first; in such cases the patient is desired to dilute it with an equal quantity of water, and the strength is gradually increased to the proportion of No. 1. No. 2 is never used in the first instance, and it is only in a very few cases that it can be employed with safety till after the employment of No. 1 has ceased to be of farther service, and the morbid irritability is much lessened.

No other forms of iodine or its compounds have been used in chronic ulceration of the cornea at the Eye Dispensary. I

subjoin shortly my conclusions as to the use of iodine in diseases of the eye.

I. In Ophthalmia Tarsi none of the preparations No. 1, 2, 3, 4, 5, 6, 7, are of equal service with other well known remedies.

II. In Ophthalmia Tarsi the ungt. Iodidi Plumbi, No. 7, is more efficacious than any of the other preparations.

III. In chronic and subacute Strumous Sclerotitis the internal use of the solution of iodine and hydriodate of potass, No. 4, though of some service, is inferior to many other tonics, and never to be compared with sulphas quinæ.

IV. Chronic irritable ulceration of the Cornea is more benefitted by the solution, No. 1, than by almost any other collyrium I have hitherto employed.

I am, dear Sir, yours truly,

JAMES HUNTER, M.D.

Leith Walk, Edinburgh,
March 22. 1837.

APPENDIX TO THE FOREGOING COMMUNICATION.

Solutions.

No. 1. ℞ Iodine gr. ij. Hydriod. Pot. gr. iv. aq. dest. lb.j.
2. ℞ ... gr. iij. ..... gr. vi. ... lb.j.
3. ℞ ... gr. iv. ..... gr. viii. ... lb.j. M. et solve.

Concentrated solution of iodine.

4. ℞ Iod. ℈j. hydr. pot. ℈ij. aquæ ℥viij. et solve.

Ointments.

5. ℞ Hydriod. potassæ ʒss. Axung. ℥iss. M.
6. ℞ Hydriod. potassæ ʒj. ... ℥iss. M.
7. ℞ Iodidi plumbi, ʒj. .. ℥j. M.