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From the Author.

AN

EXPERIMENTAL RESEARCH

ON THE

ANTAGONISM BETWEEN THE ACTIONS OF PHYSOSTIGMA AND ATROPIA.

BY

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XXI.—*An Experimental Research on the Antagonism between the Actions of Physostigma and Atropia.* By Thomas R. Fraser, M.D., Lecturer on Materia Medica and Therapeutics at Surgeon's Hall, Edinburgh. (Plates XXIII. to XXV.)

(Read 29th May 1871.)

INTRODUCTION.

It is natural to suppose that soon after it became known that injurious effects follow the introduction of certain substances into the system, attempts were made to remedy these effects, and also to discover counteragents, or antidotes, to the hurtful substances. The success attending these attempts must, of necessity, have been closely related to the existing state of knowledge regarding the actions of active substances. When the effects of poisons were referred to supernatural manifestations, it was chiefly charms and superstitious rites that were trusted to as protectives and remedies. At a somewhat more advanced period in the progress of human knowledge, vague notions of physiological laws and processes supplied the indications of curative treatment. Alexipharmics, Mithridates, and theriacæ were compounded of substances possessing eliminative and so-called "general stimulant" properties, and bezoars of such as enjoyed a reputation as specifics against poisonous influences; and these were employed, almost indiscriminately, as universal antidotes. Still later, chemistry suggested that, as the physical properties of poisons may be modified by various re-agents, so may their effects be prevented by the administration of suitable substances.

The recommendations derived from chemistry were at first only of the crudest description; but as the science advanced, many valuable hints were obtained, and now the class of the chemical antidotes probably includes the largest number of efficient counteragents to poisons. Alkalies and acids are employed to neutralise each other, tannin to render insoluble tartar emetic and many vegetable alkaloids, hydrated sesquioxide of iron to precipitate arsenious acid, and soluble and inert sulphates to decompose lead salts, and render them unabsorbable. In these examples, as well as in the many others belonging to this class, the operation of the antidote is limited to the chemical change it produces on the poison while it remains in the alimentary canal. As soon as the poison becomes absorbed into the blood, it appears to pass beyond the antidotal influence of the chemical counterpoison, for no example exists of a chemical antidote neutralising a poison after absorption. Thus it is that the value of such antidotes is considerably restricted.

Physiological Antagonism.

Localised Antagonism. — In order perfectly to neutralise the effects that follow the introduction of a poison into the living economy, it would appear to be necessary that the physiological functions of the affected organism should be modified. The early, though, undoubtedly, crude notions that originated the employment of alexipharmics, Mithridates, and theriacæ, to a certain extent recognised this principle. The more perfect knowledge acquired within recent times regarding the functions of structures and organs, has led to the discovery that various substances are able to modify them in a definite and constant manner, and that the modifications produced by certain substances are of a nature contrary or opposite to that of those produced by others. By such observations, the existence of physiological antagonism between certain of the effects of different active substances has been demonstrated. Several apparently well-authenticated examples have been made known: among which may be instanced the antagonism between the actions on the iris and on the minute blood-vessels, of opium or morphia on the one hand, and belladonna, hyoscyamus, and stramonium on the other; between the actions on the capillary circulation of morphia and quinia; between the actions on the vagi nerves of physostigma and atropia, hydrocyanic acid and atropia, and muscaria and atropia; and between the actions on the iris and on visual accommodation of physostigma and atropia.

General and Lethal Antagonism.—In some instances, the existence of such limited counteractions has led to the supposition that the general, or, at least, the primary lethal action of one of the substances concerned is capable of being antagonised by the physiological action of the other. A notable instance of this is to be found in the revival, by the late Dr Thomas Anderson, in 1854, of the old, but, at that time, almost forgotten doctrine, that belladonna is a physiological antidote to the poisonous action of opium.* Anderson was led to this idea from the fact that these two substances produced contrary effects on the iris. The occurrence of an antagonism limited to a single organ in no important degree related to the continuance of life is, however, an insufficient reason for supposing that the general actions of any two substances are of an antagonistic nature. In order legitimately to infer whether one substance is capable of acting as a physiological antidote to another, it is necessary to acquire a definite knowledge of the exact nature of the general physiological action exerted by each of them. As yet the action of only a few substances has been ascertained with the completeness that is required; and hence it is that the examples that have been advanced of general antagonism between the actions

* Edinburgh Medical and Surgical Journal, vol. xviii. 1854, p. 377.

of active substances are but few in number, while the evidence on which these examples have been founded is generally imperfect.

Between Opium and Belladonna, Hyoscyamus or Stramonium.—Among the various instances in which a general antagonism has been stated to exist between the actions of active substances, in the sense that the lethal effect of the one substance is capable of being prevented by the physiological action of the other, the most familiarly known is that where the substances are, on the one hand, opium, and, on the other, belladonna, hyoscyamus, or stramonium. The existence of a belief in the power of belladonna to counteract the general physiological action of opium, may be referred to so early a date as the year 1570, when it was recorded by PETRO PENA and MATHIA DE LOBEL that certain Italian peddlers gained much notoriety by employing the root of the belladonna plant to quench thirst, and by administering opiates to remedy the evil effects that were occasionally produced thereby.* In 1661, HORSTIUS reported a case in which the injurious effects of a large dose of the inspissated juice of belladonna were apparently removed by the use of opium.† Soon afterwards, FABER related a somewhat similar experience;‡ and, in 1766, BOUCHER, of Lille, published five cases of poisoning by belladonna berries, in two of which opium was administered as an antidote.§ At the commencement of the present century, JOSEPH LIPPI wrote an inaugural dissertation, "De veneficio baccis belladonnæ producto atque opii in eo usu," in which were recorded, according to GIACOMINI, "pleusieurs guérisons à l'aide de laudanum de SYDENHAM."‖ GIACOMINI himself expresses a favourable opinion regarding the beneficial effects of opium in poisoning by belladonna; and mentions, further, that the Italians were accustomed to administer opium to remove the stupor and convulsions that follow excessive doses of hyoscyamus and stramonium. Within more recent times, many modern authors, as ANGELO POMA,¶ ANDERSON,** CAZIN,†† BENJAMIN BELL,‡‡ BÉHIER,§§ LEE,‖‖ NORRIS,¶¶ and CONSTANTIN PAUL,*** have published evidence that appears to favour a belief in the existence of this antagonism. This evidence has been derived from cases of poisoning in man by opium, in which belladonna, hyoscyamus,

* Stirpium Adversaria Nova, authoribus PETRO PENA et MATHIA DE LOBEL, Medicis. Londini, 1570, p. 103. (Quoted by Dr NORRIS, The American Journal of the Medical Sciences, vol. xliv. 1862, p. 399.)

† Opera Medica. ‡ Strychnomania, 1677.

§ Journal de Médecine, Chirurgie et Pharmacie, etc., tome xxiv. 1776, pp. 310–332.

‖ Traité philosophique et expérimental de Matière Médicale et Thérapeutique, traduit par MAJON et ROGNETTA, 1839, p. 537.

¶ Gazette Hebdomadaire, 10 Avril 1863. ** *Loc. cit.*

†† Traité des Plantes Médicinales Indigènes, 1855.

‡‡ The Edinburgh Medical Journal, vol. iv. 1859, pp. 1–7.

§§ L'Union Médicale, Juillet 1859.

‖‖ The American Journal of the Medical Sciences, vol. xliii. January 1862, p. 54.

¶¶ Ibid., vol. xliv. October 1862, p. 395.

*** De L'Antagonisme en Pathologie et en Thérapeutique, 1866, pp. 92–115.

or stramonium was used as a physiological antidote; and, conversely, of poisoning with one or other of the latter substances, in which opium was used as an antidote. In presence of the numerous important fallacies that are inseparably connected with such evidence, it would be vain to expect that from it alone an absolute demonstration could be obtained of the existence of a general antagonism so perfect as to constitute any one active substance the physiological antidote of another. This evidence must, therefore, be regarded as unsatisfactory, more especially as several observers of recognised ability, as Dr JOHN HARLEY* and L. ORFILA,† have pronounced it insufficient, after a careful examination of the record of each case.

The general result of the investigations that have been made to decide this question by experiments on the lower animals, is also of an inconclusive character. No doubt, the experiments of BOIS,‡ CAMUS,§ ONSUM,‖ and BROWN-SEQUARD¶ appear to show that the lethal action of opium cannot be prevented by the physiological influence of belladonna, hyoscyamus, or stramonium, nor that of the latter substances by opium; but these experiments are open to the objection, that the doses of the substances used as antidotes do not seem to have been sufficiently varied.

At the same time, there can be little doubt that the evidence derived from both clinical observation and experimental research is sufficient to show that several of the actions of opium are of a contrary nature to those of belladonna, hyoscyamus, and stramonium.** It is, however, equally undoubted that, in the meantime, this evidence is insufficient to *prove* the existence of a general antagonism; or of one between actions of sufficient importance to constitute opium a physiological antidote to belladonna, hyoscyamus, or stramonium, or these latter substances physiological antidotes to opium. The question still remains an open one; but such knowledge as is already possessed renders it probable that a general antagonism does really exist, to the extent, at any rate, of the primary lethal action of opium or morphia being preventable by the physiological action of belladonna, hyoscyamus, or stramonium. A properly devised series of experiments would in all likelihood justify the opinion of those who, with no little courage, have practically affirmed their belief in the existence of this antagonism.

* The Old Vegetable Neurotics, 1869.

† Dictionnaire Encyclopédique des Sciences Médicales (Atropine), tome vii. 1867, p. 215.

‡ Gazette des Hôpitaux, 1864.

§ Etude sur l'antagonisme de l'opium et de la belladonne. Thèse de Paris, 1865.

‖ Schmidt's Jahrbucher, 1865, Bd. 128, p. 288.

¶ Journal de la Physiologie de l'homme et des animaux, tome 3me, 1860, p. 726.

** Interesting accounts of several of these contrary actions, founded on careful clinical observation, have been published by Drs MITCHELL, KEEN, and MOREHOUSE (see their paper "On the Antagonism of Atropia and Morphia," in the American Jour. of the Med. Sciences, Vol. L. 1865, p. 67; and also by Dr ERLENMEYER (for an abstract of whose paper, see "L'antagonisme de l'opium et de la belladonne," by Dr RAYNAUD, Paris, 1866, p. 40).

The recent development of the study of Pharmacology has led not only to the acquisition of knowledge regarding the exact manner in which many active substances influence the physiological conditions of vital structure, but also to the differentiation of the special structures, by the modification of whose physiological conditions the lethal action of these substances is produced. In a few instances it has been shown that the nature of the modification produced in the physiological condition of the structure or structures involved in the lethal action of the substance is apparently contrary to that produced on the same structure or structures by the physiological action of another substance. The establishment of such facts has led, within the last few years, to the suggestion of two instances of antagonism,—the first being between the lethal action of prussic acid and the physiological action of atropia, and the second between the lethal action of muscaria and the physiological action of atropia.

Between Atropia and Prussic Acid.—For the first of these instances Pharmacological science is indebted to Professor PREYER of Jena. In the course of an elaborate research* on the action of prussic acid,—a research that may fairly be characterised as the most important that has yet been made on the action of this substance,—PREYER established that the primary lethal action is due to embarrassment of the respiratory and cardiac functions. He further showed that the embarrassment of the former function is caused by stimulation of the terminations of the vagi nerves in the lungs, and by impairment of the activity of the respiratory nerve-centre, while the embarrassment of the latter function is caused by excessive stimulation of the inhibitory cardiac fibres of the vagi nerves. Previous investigators—more especially Von BEZOLD and BLŒBAUM†—had already shown that atropia produces effects that are in a remarkable manner contrary to these ; for, in certain doses, it accelerates both the respiratory and the cardiac movements,—the former, by paralysing the terminations of the vagi nerves in the lungs, and by stimulating the respiratory nerve-centre, and the latter, by paralysing the inhibitory cardiac fibres of the vagi nerves. Guided by these facts, PREYER made a few experiments which strongly support the opinion he has arrived at, that atropia is a physiological antagonist to prussic acid, even to the extent of being able to prevent the primary lethal action of that poison. It is, however, to be regretted that no attempt was made absolutely to demonstrate that the dose of prussic acid used in each experiment was a lethal one, more especially as the subsequently performed experiments of Professor BARTHOLOW—limited, no doubt, in their scope—do not seem to confirm PREYER's opinion.‡

* Die Blausäure. Physiologisch Untersucht. Von W. PREYER, Dr. Med. et Phil. Bonn, 1870.

† Ueber die physiologischen Wirkungen des schwefelsauren Atropins. Von A. v. BEZOLD und Dr FRIEDR. BLŒBAUM. (Untersuchungen aus dem physiologischen Laboratorium in Würzburg. 1867.)

‡ The Physiological Effects and Therapeutical Uses of Atropia and its Salts, 1869, p. 25.

Between Atropia and Muscaria.—The second of the instances mentioned was first made known by SCHMIEDEBERG and KOPPE, in a very interesting memoir on Muscaria, published in 1869.* This active principle was separated by them from *Agaricus muscarius*, L., and found to possess an action in many respects contrary to that of atropia. The general nature of its lethal action was observed to be similar to that of prussic acid; and, accordingly, the reasons which induced SCHMIEDEBERG and KOPPE to examine as to an antagonism between it and atropia were analogous to those by which PREYER was led to investigate the influence of atropia in counteracting the primary lethal action of prussic acid. In this instance, likewise, only a very few experiments were made. Their results, however, are strongly in support of the existence of a more or less general physiological antagonism between the two substances.

Various other instances of General and Lethal Antagonism.—In addition to these, many other examples of general or of lethal antagonism have been advanced. Their existence, however, has rarely been inferred from a knowledge that the substances concerned influence the same structures in contrary modes, but has been conjectured from a knowledge merely of the general phenomena which are produced by these substances. The conspicuous spasmodic effects by which the action of strychnia is characterised, appear to have suggested the employment, as physiological counteragents, of various substances whose general action includes the production of paralysis; and, accordingly, the list of proposed antagonists to this alkaloid includes opium,† curara,‡ aconite,§ nicotia,‖ bromide of potassium,¶ chloroform,** chloral,†† and nitrite of amyl.‡‡ Opium and quinia have been proposed as antidotes to each other, because the former exalts several of the organic functions, whilst the latter depresses them.§§ General antagonism has been inferred between chloroform and sulphuric ether, solely on the ground that the anæsthetic action of the former is supposed to be accompanied with depression, and that of the latter with excitement ;‖‖ and the

* Das Muscarin. Das Giftige alkaloid des Fliegenpilzes. Von Dr OSWALD SCHMIEDEBERG und Dr RICHARD KOPPE. Leipzig, 1869.

† PELLETIER et CAVENTOU. See Dictionnaire Encyclopédique des Sciences Médicales (Antidote), tome 5me, 1866, p. 322.

‡ L. VELLA. Comptes Rendus des Séances de l'Académie des Sciences, xlix. 1859, p. 330, and li. 1860, p. 353.

§ E. WOAKES. The British Medical Journal, October 26, 1861, p. 440.

‖ S. HAUGHTON. Dublin Quarterly Journal of Medical Science, August 1862.

¶ F. A. SAISON. Du Bromure de Potassium et de son Antagonism avec la Strychnine. Paris, 1868.

** T. GALLARD. Annales d'Hygiène publique et de Médicine Légale, t. xxiv. 1865, pp. 182–184.

†† OSCAR LIEBREICH, Comptes Rendus des Séances de l'Académie des Sciences, lxx. 1870, p. 403; BENNETT, Edinburgh Medical Journal, 1870, v. 16, part 1, p. 262; GROVES, Medical Press and Circular, 1870, p. 398.

‡‡ J. ST CLAIR GRAY. Glasgow Medical Journal, February 1871, p. 188.

§§ GUBLER. Société Médicale des hôpitaux, 10 Février, 1858; and Commentaires Thérapeutiques du Codex Medicamentarius, 1868, p. 591.

‖‖ FALIN. Thèse, 1860. (Quoted by CAMUS, *op. cit.* p. 122.)

physiological actions of iodine and bromine are said to neutralise each other because the former produces sedation, and the latter excitation of certain general functions.*

Among these examples there are several worthy of further examination, and it is not impossible that their existence may thereby be established. Meanwhile, the criticism of the Professor of Therapeutics at Paris, in reference to the majority of recorded examples of antagonism, appears to be a just one, that "la précision fait souvent défaut dans l'analyse des faits, les inductions manquent de rigueur, et la pratique attend de nouvelles lumières de la part de la physiologie expérimentale et de la thérapeutique rationnelle."†

Between Physostigma and Strychnia.—This criticism is also applicable to much that has been advanced regarding antagonism between physostigma and certain other substances. The first instance that has been suggested of an antagonism in which physostigma is concerned, is that between it and strychnia. The spinal excitant action of the latter substance was naturally looked upon as more or less contrary to the paralysing influence exerted by physostigma on the spinal cord. In a paper published by me in 1862,‡ an experiment is described which lent some countenance to this surmise. Since that time experiments have been made by NUNNELEY,§ VÉE,‖ and EBEN WATSON,¶ which, on the whole, support the opinion that the spasmodic effects of strychnia may be diminished by the paralysing action of physostigma. They are, however, insufficient to decide whether the lethal action of the one substance can be prevented by the physiological action of the other.

Between Physostigma and Chloral.—In the remaining instance, the power of chloral to counteract the lethal action of physostigma has been experimentally tested by Professor BENNETT. It is, however, impossible to decide how far the opinion expressed by this observer, that chloral has a most marked influence in counteracting the lethal action of physostigma, is justified by the results of his experiments, as only a very brief account of them has as yet been published.**

* GUBLER. Bulletin Général de Thérapeutique, tome lxvii. 1864, p. 9.

† GUBLER. Dictionnaire Encyclopédique des Sciences Médicales (Antidote), tome 5me, 1866, p. 322.

‡ "On the Characters, Actions, and Therapeutic Uses of the Ordeal Bean of Old Calabar." Edinburgh Medical Journal, vol. ix. 1863, p. 245; and reprint, p. 19. See also, "On the Physiological Action of the Calabar Bean." Transactions of the Royal Society of Edinburgh, vol. xxiv. part iii. 1866–7, p. 740.

§ "On the Calabar Bean: its Action, Preparations, and Use." Lancet, 1863; and pamphlet, pp. 12–15.

‖ Recherches Chimiques et Physiologiques sur la Fève du Calabar (Thèse). Par le Dr AMÉDÉE VÉE. Paris, 1865, pp. 28–30.

¶ "On the Physiological Actions of the Ordeal Bean of Calabar, and on its Antagonism to Tetanus and Strychnia Poisoning." Edinburgh Medical Journal, vol. xii. May 1867, p. 999; and reprint, pp. 17–25.

** "On Chloral in Phthisis, and its Antagonism to the poisonous effects of Calabar Bean." The Practitioner, vol. iv. 1870, p. 262.

This account, however, does not very obviously support Professor BENNETT's opinion; for, of the eight experiments mentioned, in which rabbits were subjected to the influence of the two substances, seven terminated in death, and only one in recovery. Further, there is no evidence to show conclusively that the rabbit that formed the subject of the apparently favourable experiment had received a dose of physostigma sufficient to have caused its death had no chloral been administered.

In the preceding historical sketch every important alleged example of antagonism has been referred to. It has been shown that although in many cases the *à priori* reasons in favour of the existence of a lethal or of a more or less general antagonism are extremely plausible, the experimental data by means of which it has been attempted to establish the reality of the antagonism are probably, without exception, imperfect, and therefore insufficient to do so. I trust, however, that the description of the research forming the subject of the present communication will render it obvious that the reality of a lethal antagonism may be readily and certainly established by experiment.

ANTAGONISM BETWEEN THE ACTIONS OF PHYSOSTIGMA AND ATROPIA.

This research on the antagonism between the actions of physostigma and atropia was commenced in April 1868, and the results of some of the earlier experiments were published in a preliminary note read before this Society, on the 30th of May 1869.* In this note were described a number of experiments, which prove that the lethal action of physostigma may be prevented by the physiological action of atropia.

Previous to this time, however, the attention of more than one observer had been attracted to the subject. In 1864, KLEINWÄCHTER narrated an interesting case of poisoning with an unknown quantity of atropia, in which the internal administration of physostigma produced a marked amelioration of the symptoms.† Three years subsequently, BOURNEVILLE, of Paris, in a paper on the treatment of tetanus by physostigma,‡ described an experiment in which he, in the first place, introduced into the stomach of a cabiai a quantity of powdered kernel of physostigma, sufficient, in his opinion, to cause death, and then, while severe symptoms were present, injected subcutaneously a small quantity of atropia, with the result that the symptoms quickly diminished in severity, and the cabiai ultimately reassumed a normal condition. At the time when my preliminary note was published, BOURNEVILLE's experiment was quite unknown to me, and it is with much satisfaction that I now draw attention to it as an independent observation harmonising with the results I had obtained when my

* Proceedings of the Royal Society of Edinburgh, 1868–69, pp. 587–590.

† Berliner Klinische Wochenschrift, No. 38, 1864, p. 369.

‡ De l'Emploi de la Fève de Calabar dans le Traitment du Tetanus Paris, 1867.

preliminary note was published, and have since greatly extended.* The observations of another experimenter, Professor BARTHOLOW, of Cincinnati, have likewise only recently come to my knowledge. The publication, in the "Practitioner" of February 1870, of a paper by me on "Atropia as a Physiological Antidote to the Poisonous Action of Physostigma," directed Dr BARTHOLOW's attention to my researches, and by his courtesy and kindness I have been favoured with a copy of an essay on "Atropia," which he had published in 1869. I am thereby enabled to supply an omission that would otherwise have occurred in this account of the literature of the subject, for the essay contains not only an interesting theoretical discussion on the antagonism between atropia and physostigma, but also several experiments bearing on its existence. The experiments were performed on frogs and cats, and a description is given of two experiments on each of these species of animal. One experiment on a frog and one on a cat terminated in recovery, while the two others terminated in death. From these experiments Dr BARTHOLOW deduces a number of general conclusions regarding the mutual counteraction of the two substances on several of the structures and functions modified by them. The following quotation contains an epitome of his views :—"Atropia is not a physiological antagonist to physostigma, except in regard to their action on the organic nervous system. It would be improper, then, to use atropia against poisoning by Calabar bean. . ."† The second of these propositions seems to imply that the existence of a lethal antagonism was not favoured by the results of the experiments. The account given of the experiments, however, does not justify any opinion as to how far the non-existence of a lethal antagonism is supported by them, for, unfortunately, the obviously necessary information is omitted by which to judge if a lethal dose of one or other substance had been administered to either of the animals that recovered.

Preparations used in the Research.—In this research physostigma was administered in the form either of an alcoholic extract, or of the sulphate of the active principle.

The alcoholic extract was prepared by placing a moderately fine powder of the kernel in a percolator, acting upon it with alcohol (84 per cent.) until the powder was exhausted, and then concentrating the tincture by distillation and by evaporation on a water bath, until an extract of ordinary consistence was

* Since this sentence was written, I have received a more recent paper by M. BOURNEVILLE, which contains evidence of an absolutely satisfactory nature regarding the power of atropia to counteract the lethal action of physostigma. It is entitled, "De l'Antagonisme de la Fève de Calabar et de l'Atropine," and appears to be a reprint from the "Revue Photographique des Hôpitaux," of June 1870. A description is given of five experiments on guinea pigs, in which non-lethal doses of atropia were administered a few minutes after lethal doses of extract of physostigma, with the result that recovery took place in all of the experiments. The great value of the evidence contained in this paper depends on the fact that the doses of physostigma given were proved to be at least equal to the minimum lethal. This was accomplished in much the same way as has been described in my preliminary note in the Proceedings of this Society, and in my communication to the "Practitioner" of February 1870.

† *Loc. cit.* p. 46.

obtained. This preparation contains a considerable quantity of fatty matter, which prevents its complete solution in water; and as the division into separate doses of a mere watery suspension would lead to many inaccuracies, it was found necessary to weigh the requisite quantity separately for each experiment. It is also hygroscopic, which further required that it should be dried and kept in an exsiccator, in order to ensure an unvarying preparation. Nearly all the experiments in which an extract was used were made with one prepared in this manner, and a sufficient quantity was obtained by one process to serve for the entire research. A few experiments, however, were made with an extract for which I am indebted to Dr Cook, of the firm of Messrs T. and H. Smith, of Edinburgh. It will be seen, from the description of these experiments, that Dr Cook's extract is more powerful than that prepared by myself, and this may be accounted for by the fact that absolute alcohol was employed in its preparation.

The active principle, physostigmia,* whose sulphate was also used in this research, was obtained by the following process. Alcoholic extract of physostigma was mixed with distilled water, and the fatty matters were completely removed by agitation with successive portions of sulphuric ether. An excess of bicarbonate of sodium was then added to the watery solution, and the resulting alkaline liquor was shaken with successive portions of ether. The decanted etherial solutions were washed with water, concentrated by distillation, and then evaporated spontaneously, by which means a residue consisting of an impure physostigmia was obtained. This was dried over sulphuric acid, and treated with anhydrous ether, and on evaporating the etherial solution, a less impure physostigmia was obtained in the form of a pale brown extract-like substance. From it the sulphate was prepared by neutralising a solution in rectified spirit with very dilute sulphuric acid, and evaporating at a low temperature. This sulphate is a pale brown amorphous substance, readily soluble in distilled water. As watery solutions of the vegetable alkaloids gradually undergo decomposition, it was considered advisable to weigh separately the dose required for each experiment. Physostigmia, in common with the extract, possesses the inconvenient property of absorbing moisture from the atmosphere, and for this reason, the obviously necessary precaution was adopted of keeping the sulphate in an exsiccator.

The atropia was administered in the form of sulphate, which salt was purchased from Messrs T. and H. Smith of this city. The doses were generally

* This alkaloid was first separated by me in 1863; and in a paper published in 1864 ("On the Moth of the Eserĕ, or Ordeal Bean of Old Calabar," Annals and Magazine of Natural History, May, 1864), I named it *Eserinia*, from Eserĕ, the usual name of the ordeal poison at Calabar. Since then I have, in various publications, adhered to this name, and it has been almost invariably adopted by French physiologists and chemists. The reasons in favour of designating an active principle, derived from the vegetable kingdom, by a modification of the generic name of its botanical source are, however, so numerous and weighty, that I have thought it right in the present communication to follow the usual practice. This I have the more readily done, as the name physostigmia (or physostigmin) is now commonly to be met with in the writings of German physiologists.

weighed separately for each experiment, but in several instances it was found necessary to subdivide a recently prepared solution, as such minute doses were required that it would have been impossible to weigh them accurately.

Subjects of Experiment.—With a few exceptions, wherein dogs were used, the experiments were performed on rabbits. The animals were invariably in a state of perfect health, and in full digestion. The latter is a condition of great importance, the plan of research requiring a strict attention to the relation between the weight of the animal and the doses of the substances. The amount of food contained in the stomach appreciably modifies the weight both of dogs and rabbits, but it does so to a very marked extent in rabbits, for on several occasions I have found that an increase of three or four ounces occurred after food had been taken. As, generally, the rabbits employed were about three pounds in weight, the difference represented by such an increase is obviously of importance in estimating the doses of the substances.

Plan of Experiments.—The following plan was adopted for the experiments, as it appeared to be the one by which the most conclusive results were to be obtained :—In the first place, the minimum fatal dose for rabbits of the extract of physostigma and of the sulphate of physostigmia employed was determined by a number of preliminary experiments, so that, on the weight of the animal being ascertained it was an easy matter to be certain of the dose that could kill it. Then, in those experiments in which recovery followed the administration of a dose of atropia given in combination with a dose of physostigma equal to or in excess of the minimum fatal, the animal used was killed many days afterwards, and when the effects of the two substances had completely disappeared, by a dose of physostigma less than or only equal to that from which it had previously recovered. *Therefore, when the administration of atropia prevented an otherwise fatal dose of physostigma from causing death, a perfect demonstration was obtained of the power of atropia to produce some physiological action or actions that counteracted some otherwise lethal action or actions of physostigma.*

The administration of the substances was effected by subcutaneous injection. There is an abundance of evidence to show that, when exhibited by subcutaneous injection, the activity of a substance, relatively to its dose, is considerably greater than when it is exhibited by introduction into the stomach. By adopting this method, therefore, the existence of a lethal antagonism was subjected to a more severe test than if the substances had been introduced into the stomach ; for, not only are the general physiological effects produced with greater rapidity and certainty, but also the lethal action of a minimum fatal dose is induced in a shorter time when the substances are injected under the skin than when they are introduced into the stomach. This method of administration has, besides, the great recommendation of being followed by results constant as to both character and time of occurrence ; for not only is the total quantity, within cer-

tain limits, of the substance absorbed into the blood, but also the process of absorption is commenced directly after the injection is effected. Further, it has the great advantage of convenience, wherein it is greatly superior to the method by introduction into the stomach.

Chief Objects of the Research.—As evidence was obtained at an early period in this research of the existence of an antagonism between the general actions of physostigma and atropia, a wide field for further investigation was thereby opened up. In the experiments that will be described in the first portion of this communication, I shall endeavour to show, as clearly as possible, that atropia possesses, in a remarkable degree, the power of counteracting the lethal action of physostigma. In the subsequent portion of the communication the extent of this power will be examined and its limits defined.

Section A.—Examination of the Influence of Atropia upon the Lethal Activity of Physostigma.

Determination of the Minimum Lethal Doses of the Preparations.

In accordance with the plan that has been adopted for this research, several preliminary experiments were made in order to determine the minimum lethal dose for rabbits of each of the preparations employed. For the present purpose it is sufficient to mention only the leading results of these experiments.

Minimum Lethal Dose of Sulphate of Atropia.—In the following table a summary is given of experiments undertaken to determine the minimum lethal dose for rabbits of sulphate of atropia.

Number of Experiment.	Weight of Rabbit.	Actual Dose.	Dose per 3 lbs. Weight of Animal.	Result.	Notes.
1.	4 lbs. 13 oz.	4 grs.	2·49 grs.	Recovery.	The only effects were dilatation of the pupils, slight restlessness, and acceleration of the cardiac contractions and of the respirations.
2.	4 lbs. 10 oz.	5 grs.	3·24 grs.	Recovery.	Do.
3.	4 lbs. 8 oz.	9 grs.	6 grs.	Recovery.	Do. Also some obvious symptoms of visual derangement.
4.	3 lbs.	6·5 grs.	6·5 grs.	Recovery.	Distinct, though unimportant, paralytic symptoms were produced, the respirations were reduced in frequency, the cardiac action was accelerated, and the pupils were dilated.
5.	3 lbs. 5 oz.	7·9 grs.	7·5 grs.	Recovery.	Do.

Number of Experiment.	Weight of Rabbit.	Actual Dose.	Dose per 3 lbs. Weight of Animal.	Result.	Notes.
6.	2 lbs. 15 oz.	7·34 grs.	7·5 grs.	Recovery.	Do.; excepting reduction in the frequency of the respirations.
7.	2 lbs. 4 oz.	6 grs.	8 grs.	Recovery.	Do. do.; and production of hypnosis.
8.	3 lbs.	9 grs.	9 grs.	Recovery.	Dilatation of the pupils, increase in the frequency of the cardiac and respiratory movements, and slight paralysis were produced.
9.	3 lbs. 2 oz.	15·6 grs.	15 grs.	Recovery.	Dilatation of the pupils, acceleration of the heart's action, increase followed by reduction in the rate of the respirations, distinct paralysis, and tremors and starts, were produced.
10.	2 lbs. 12 oz.	16·5 grs.	18 grs.	Recovery.	Do.
11.	3 lbs.	19·5 grs.	19·5 grs.	Recovery.	The chief effects were dilatation (not extreme) of the pupils, acceleration followed by slowing and weakening of the heart's action; reduction in the rate of the respirations; hypnosis; and well-marked paralysis.
12.	2 lbs. 13 oz.	19·9 grs.	21 grs.	Death, in more than 1 hour, and less than 5 hours 30 minutes.	Do.
13.	2 lbs. 13½ oz.	19·9 grs.	21 grs.	Recovery.	Do.
14.	3 lbs. 2 oz.	23·43 grs.	22·5 grs.	Recovery.	Do.
15.	3 lbs. 1½ oz.	22·9 grs.	22·5 grs.	Recovery.	Do.
16.	3 lbs. 6 oz.	27 grs.	24 grs.	Death in 35 minutes.	The chief effects were dilatation (not extreme) of the pupils; acceleration soon followed by slowing and great weakening of the heart's action; reduction in the rate and strength of the respirations; paralysis; and feeble tremors and spasms.

In each of these experiments every precaution was taken to prevent fallacy It will, however, be observed, that while, in one case, a dose of 21 grains, and in another one of 24 grains per three pounds weight, was found sufficient to cause

death, in two other cases recovery followed the administration of 22·5 and of 21 grains respectively. It must, therefore, be allowed that the minimum fatal dose has only approximatively been determined. A more accurate determination could not be effected without greatly increasing the number of experiments. Fortunately, however, it was unnecessary to incur the trouble and expense* that would thereby have been entailed, as an approximative determination of the minimum fatal dose of atropia was all that was needed for the purpose of this research.†

Minimum Lethal Dose of Extract of Physostigma.—The experiments which are mentioned in the next table were undertaken to determine the minimum lethal dose for rabbits of extract of physostigma.

Number of Experiment.	Weight of Rabbit.	Actual Dose.	Dose per 3 lbs. Weight of Animal.	Result.
17.	3 lbs. 3 oz.	0·8 gr.	0·7 gr.	Recovery.
18.	3 lbs.	0·9 gr.	0·9 gr.	Recovery.
19.	3 lbs. 2 oz.	0·93 gr.	0·9 gr.	Recovery.
20.	3 lbs. 8 oz.	1·2 gr.	1·02 gr.	Recovery.
21.	3 lbs. 6 oz.	1·18 gr.	1·05 gr.	Recovery.
22.	2 lbs. 14 oz.	1 gr.	1·05 gr.	Recovery.
23.	3 lbs. 1 oz.	1·2 gr.	1·2 gr.	Death, in about 27 minutes.
24.	3 lbs. 6 oz.	1·35 gr.	1·2 gr.	Death, in about 23 minutes.
25.	3 lbs. 5 oz.	1·32 gr.	1·2 gr.	Death, in about 33 minutes.
26.	3 lbs. 2 oz.	1·87 gr.	1·8 gr.	Death, in about 16 minutes.

The results of these experiments indicate that the minimum lethal dose for rabbits of extract of physostigma is 1·2 grain for every three pounds weight of animal, or 0·4 grain for every pound.

Minimum Lethal Dose of Sulphate of Physostigmia.—The minimum lethal dose for rabbits of sulphate of physostigmia was discovered by the experiments that are epitomised in the next table.

* The price of sulphate of atropia being a little more than fifteen shillings for sixty grains, the question of expense becomes worthy of consideration.

† The minimum lethal dose of sulphate of atropia, administered subcutaneously, appears to be smaller for dogs than for rabbits. Among other experiments, I have performed the following :—A dog, weighing seven pounds and fifteen ounces, received twenty grains, and recovery followed; but when a dose of twenty-five grains was given to the same dog, eight days subsequently, death occurred in twenty-three minutes. Another dog, weighing sixteen pounds, which, seven days previously, had recovered after the administration of ten grains, died on the fourth day after it had received fifteen grains.

Number of Experiment.	Weight of Rabbit.	Actual Dose.	Dose per 3 lbs. Weight of Animal.	Result.
27.	3 lbs. 8 oz.	0·035 gr.	0·03 gr.	Recovery.
28.	3 lbs. 1 oz.	0·076 gr.	0·075 gr.	Recovery.
29.	3 lbs. 11 oz.	0·1 gr.	0·081 gr.	Death, in about 33 minutes.
30.	3 lbs. 2 oz.	0·1 gr.	0·096 gr.	Recovery.
31.	3 lbs. 1 oz.	0·12 gr.	0·117 gr.	Death, in about 37 minutes.
32.	3 lbs. 5 oz.	0·13 gr.	0·117 gr.	Death, in about 44 minutes.
33.	3 lbs. 4 oz.	0·13 gr.	0·12 gr.	Death, in about 34 minutes.
34.	2 lbs. 14 oz.	0·13 gr.	0·13 gr.	Death, in about 22 minutes.
35.	3 lbs. 6 oz.	0·15 gr.	0·13 gr.	Death, in about 16 minutes.
36.	3 lbs. 4 oz.	0·16 gr.	0·147 gr.	Death, in about 25 minutes.
37.	3 lbs.	0·15 gr.	0·15 gr.	Death, in about 28 minutes.
38.	3 lbs. 3 oz.	0·16 gr.	0·15 gr.	Death, in about 21 minutes.
39.	3 lbs. 2 oz.	0·19 gr.	0·18 gr.	Death, in about 16 minutes.
40.	3 lbs. 1 oz.	0·18 gr.	0·18 gr.	Death, in about 19 minutes.

From these experiments, it would appear that in rabbits the minimum lethal dose of sulphate of physostigmia is a little less than 0·12 grain for every three pounds weight of animal, or 0·04 grain for every pound. The experiment in which death occurred after the administration of 0·08 grain per three pounds weight (Expt. 29), must be regarded as an exceptional one, seeing that during it the rabbit was in a violently excited state; and the constant energetic movements that were made placed the animal in an unfavourable condition to resist the toxic influence of a poison that materially embarrasses both the cardiac and the respiratory functions. Still, even after excepting this experiment, the table shows that 0·12 grain per three pounds is a dose rather in excess of the minimum fatal. I have, however, adopted it as the minimum fatal dose; and the ratio of one to ten that is thereby obtained between corresponding lethal doses of sulphate of physostigmia and extract of physostigma is a very convenient one, and greatly facilitates the substitution of the one substance for the other in doses credited with equal lethal activity.

It may not be altogether unnecessary to point out that the results of these determinations are applicable only to the special preparations with which they have been obtained; for the composition, and therefore the lethal activity, of each of them varies somewhat in accordance with the processes followed in its manufacture.

Influence of Atropia on the Lethal Action of Physostigma.

The minimum fatal dose for rabbits of the extract of physostigma and of the sulphate of physostigmia having thus, with considerable accuracy, been determined, the influence of atropia on the lethal action of physostigma formed the next subject of examination.

Atropia administered before Physostigma.—The nature of this influence when atropia is administered before physostigma is shown by the following experiments:—

Experiment **41-a.**—In a rabbit weighing two pounds and fifteen and a half ounces, it was found that the number of the cardiac impulses was 40 in ten seconds, and of the respirations 12 in ten seconds, and that the pupils measured $\frac{14}{50}$ths × $\frac{13}{50}$ths of an inch.

Three-tenths of a grain of sulphate of atropia, dissolved in 30 minims of distilled water, was injected under the skin of the left flank. In two minutes and thirty seconds thereafter, the pupils measured $\frac{16}{50}$ths × $\frac{16}{50}$ths of an inch; and in four minutes, the cardiac impulse occurred 54 times in ten seconds.

Five minutes after the injection of sulphate of atropia, one grain and a fifth of extract of physostigma, suspended in 25 minims of distilled water, was injected under the skin at the right flank; and, immediately afterwards, the syringe was washed out with 15 minims of distilled water, and this solution injected under the skin at the right hip—the whole operation lasting thirty seconds.

In two minutes after the total dose of physostigma had been injected, the pupils measured $\frac{17}{50}$ths × $\frac{17}{50}$ths of an inch, and infrequent fibrillary twitches were occurring at the right flank and hip. In nine minutes, the rabbit became restless, having been perfectly quiet until now, and the pupils measured $\frac{18}{50}$ths by $\frac{18}{50}$ths of an inch. Soon afterwards, fibrillary twitches were occurring generally over the surface of the rabbit, some unsteadiness was apparent in the movements, and often slight tremblings took place, especially marked in the head. In fifteen minutes, the fibrillary twitchings were more frequent and more strongly marked, so that it was difficult to distinguish the cardiac impulse, but it appeared to occur about 46 times in the ten seconds. In twenty-six minutes, the general symptoms had become slightly aggravated, as a normal posture was maintained only with difficulty; the arching of the back becoming gradually less prominent, and the head drooping a little. At the same time the fibrillary twitches had become more marked, so that the skin of the whole surface of the animal was in constant movement, and occasionally a weak spasmodic start occurred. In thirty-seven minutes, the head had so far subsided as to permit the chin to rest on the floor, but this latter posture was maintained for only a few minutes, and was succeeded by a more natural one in which the head was raised. In fifty-seven minutes, the rabbit was in a normal sitting attitude, and the chief symptom was well marked universal fibrillary twitching. The pupils measured $\frac{16}{50}$ths × $\frac{16}{50}$ths of an inch, the cardiac impulse was at the rate of 41 in the ten seconds, and the respirations 16 in the ten seconds. In one hour some urine was voided, and three minutes afterwards a considerable quantity of pultaceous and wet fæces was passed. In one hour and sixteen minutes, slight mucous sounds, apparently originating in the larynx, were heard during the respirations, and fæces having the unnatural appearance above described

were again passed. In one hour and thirty minutes, the rabbit was still in the normal sitting posture it had for some time assumed, and when it was obliged to move about no obvious difficulty could be detected. The fibrillary twitches had decreased considerably; the rate of the cardiac impulse was 40 in ten seconds; and the pupils measured $\frac{16}{50}$ths × $\frac{16}{50}$ths of an inch.

On the following day, twenty-three hours after the commencement of the experiment, the rabbit appeared to be perfectly well, for it went about actively and fed well. The rate of the cardiac impulse was 52, and that of the respirations 12 in ten seconds, and the pupils measured $\frac{16}{50}$ths × $\frac{16}{50}$ths of an inch. From this time, a gradual diminution went on in the rapidity of the heart's action, and in the size of the pupil; until, on the fifth day, the former had assumed the normal rate of 41 in ten seconds, and the latter measured exactly the same as before the experiment was commenced, namely, $\frac{14}{50}$ths × $\frac{13}{50}$ths of an inch.

On the eleventh day this rabbit was subjected to the influence of a minimum lethal dose of extract of physostigma, and the result is described in the next experiment. It is of importance to note, that during all this time food had been supplied to the rabbit *ad libitum*, as this is of importance in the maintenance of a state of absolute health, and that the same was also done in all the similar experiments of this research.

Experiment **41-b.**—This rabbit now weighed three pounds, and it was ascertained that in ten seconds the cardiac impulse occurred 41 times, and the respiratory movements 17 times, and that the pupils measured $\frac{14}{50}$ths × $\frac{13}{50}$ths of an inch.

One grain and a fifth of extract of physostigma, suspended in 25 minims of distilled water, was injected under the skin at the right flank, and the syringe washings under that at the right hip. The first effect observed was the occurrence of infrequent and slight twitchings of the *panniculus carnosus* muscle in the neighbourhood of the regions where the injections had been made, and this effect commenced in about one minute and thirty seconds after the first of the two injections. Beyond this, there was no obvious symptom until six minutes, when some slightly restless general movements were made, and at the same time movements of the mouth and lips occurred, as if an accumulation of saliva were being removed. Soon afterwards, there was evident difficulty in going about; gradually slight stiffness showed itself in the anterior, and then in the posterior extremities, which by-and-by became extended, and thereafter the rabbit stumbled about, or stood shaking with the body elevated on the extended limbs. In eight minutes, the above condition was present, and besides, the fibrillary twitchings had become more general and frequent, and the pupils slightly larger, having increased from $\frac{14}{50}$ths × $\frac{13}{50}$ths to $\frac{15}{50}$ths × $\frac{14}{50}$ths of an inch. In ten minutes, the extended state of the limbs disappeared, and was succeeded by partial paralysis, so that the rabbit now sank down on the abdomen and chest. In thirteen minutes, great general weakness, accompanied with constant

tremblings, was present, now and then somewhat severe tremors occurred, fluid (salivary) was escaping from the mouth, soft and pultaceous fæces, wet on the surface, but preserving the pellet shape, were being passed, and the pupils measured $\frac{13}{50}$ths × $\frac{12}{50}$ths of an inch. In fourteen minutes, the respiratory movements were somewhat embarrassed, and accompanied with moist sounds, while their frequency was diminished to about 10 in ten seconds. The head of the animal was now lying on the table, the back was scarcely at all curved, but the general tremors had almost disappeared, although the fibrillary twitchings had rather increased in frequency. In seventeen minutes, the rabbit fell over on the side. Only slight fibrillary twitchings were now present; the respirations were laboured, greatly impeded by mucus accumulated in the mouth and larynx, and accompanied with struggling movements of the body and limbs; the pupils measured $\frac{11}{50}$ths × $\frac{11}{50}$ths of an inch; the cardiac impulse was weak and infrequent; frothy saliva was escaping from the mouth, and liquid fæces were being passed at intervals. Very soon afterwards, the respiratory movements became mere laboured gasps, the pupils still further diminished in size, and general weak tremors succeeded each other. By-and-by it was a matter of difficulty to distinguish any respiratory movement or cardiac impulse, and then, at twenty-two minutes after the administration of the poison, death occurred.

After death, fibrillary twitchings continued for more than twenty minutes, and the first appearance of rigor was seen in thirty minutes, the extremities having then become slightly stiff (temperature of laboratory, 63° F.). The *post mortem* changes in the condition of the pupils were as follows:—at the moment of death, they dilated to $\frac{13}{50}$ths × $\frac{13}{50}$ths of an inch; in one minute, they had contracted to $\frac{12}{50}$ths × $\frac{12}{50}$ths; in two minutes, to $\frac{11}{50}$ths × $\frac{10}{50}$ths; in three minutes, to $\frac{8}{50}$ths × $\frac{7}{50}$ths; in four minutes, to $\frac{6}{50}$ths × $\frac{5}{50}$ths; in six minutes, to $\frac{5}{50}$ths × $\frac{4}{50}$ths; and they continued at the last size until twenty-four minutes after death, when they became dilated to $\frac{6}{50}$ths × $\frac{5}{50}$ths. On the following day and while strong general rigor was present, the pupils measured $\frac{10}{50}$ths × $\frac{10}{50}$ths of an inch.

The influence of atropia on the lethal action of a much larger dose of the extract was tested in the next experiment.

Experiment **42-a.**—In a rabbit, weighing three pounds and four ounces, preliminary observations showed that the average rapidity of the heart's action was 42 in ten seconds; and of the respiratory movements, 26 in ten seconds; and that the pupils measured $\frac{14}{50}$ths × $\frac{13}{50}$ths of an inch.

A seventeen-hundredth of a grain of sulphate of atropia, dissolved in 30 minims of distilled water, was injected under the skin at the left flank. Two minutes thereafter, the rate of the heart's action was 50 in ten seconds. In four minutes, it had still further increased, having attained a rate of 54 in ten seconds, while now the respiratory movements occurred 18 times in ten

seconds, and the pupils measured $\frac{16}{50}$ths × $\frac{16}{50}$ths of an inch. With these exceptions, there were no appreciable symptoms present.

Five minutes after the administration of atropia, I injected under the skin at the right flank a mixture of three grains and nine-tenths of a grain of extract of physostigma with 40 minims of distilled water; and, afterwards, under the skin at the right hip, the few drops of distilled water with which the syringe was subsequently washed. In three minutes after the injection of the extract of physostigma, the cardiac impulse occurred 58 times in ten seconds; the pupils measured $\frac{18}{50}$ths × $\frac{18}{50}$ths of an inch, and infrequent and slight twitches were present at the right flank and hip. In five minutes, the animal was somewhat restless, and the heart's rate was now 60 in ten seconds. In seven minutes, the restlessness was accompanied by slight involuntary shaking of the head; and, soon after, a great increase took place in the frequency of the fibrillary twitchings of the *panniculus carnosus* muscle over the whole surface of the body. In ten minutes, some weakness was present in the anterior extremities, and gentle tremors, brief in their continuance, occurred whenever movements were made, or the animal was startled by any cause. The weakness of the anterior extremities soon became so great that they were unable to support the fore part of the body, and then the animal sank down on the abdomen and chest. Several series of tremors followed this change of posture; and, on their termination, the head drooped until the lower jaw was rested on the table. In fifteen minutes, this posture was still unchanged, except that the arching of the back had disappeared. The cardiac impulse occurred 61 times, and the respiratory movements 19 times, in ten seconds, and the pupils measured $\frac{18}{50}$ths × $\frac{18}{50}$ths of an inch. This general condition was maintained unchanged for about fifteen minutes, with the exception of a marked decrease in the frequency of the fibrillary twitchings, and an unimportant diminution in the rate of the respiratory movements. Soon afterwards the symptoms became more serious; for in forty minutes the respiratory movements occurred only thirteen times in ten seconds, and their character was somewhat abnormal; for not only were they weak, and almost entirely confined to the diaphragm and the abdominal muscles, but the expiratory movements were abrupt and slightly spasmodic. This depreciation in the character of the respiratory movements appeared to cause considerable distress, as the animal every now and then raised the head in an uneasy manner, notwithstanding that there seemed to be great difficulty in doing so. At this time the heart's action was at the rate of 57 in ten seconds. These symptoms continued for about one hour and ten minutes, but at the end of this time a slight improvement was manifested; for, in two hours after the injection of physostigma, the respirations had increased in rate to 12 in ten seconds, and had become almost normal in their character. In two hours and thirty minutes, the improved state of the animal

was still further indicated by the head being often kept up, without any trembling, for several seconds, and by the back being again arched; but the limbs were still sprawling helplessly, and no general movement could be accomplished. The cardiac impulse was now found to recur 47 times in ten seconds, and the pupils to measure $\frac{17}{50}$ths × $\frac{17}{50}$ths of an inch, while only rarely a weak twitch in some portion of the *panniculus carnosus* muscle could be detected. The observations were now interrupted until six hours and thirty minutes after the injection of physostigma, by which time a very great improvement had taken place in the condition of the animal. A normal sitting posture had been resumed; paralytic symptoms had almost disappeared, and the rabbit was able to go about without much difficulty; and neither general tremors nor fibrillary twitchings occurred. The rate of the heart's action was 31 in ten seconds; the respirations were irregular, being 20 in one period of ten seconds, and 27 in another; and the pupils measured $\frac{17}{50}$ths × $\frac{17}{50}$ths of an inch. It was seen that in the interval during which no observations were made a large quantity of fæces, having normal characters, had been passed; but no urine had yet been voided.

On the following day, the rabbit was found going about actively, and freely consumed the food that was given to it. The cardiac impulse was at the rate of 27, and the respirations were at that of about 12, in ten seconds; but the latter were very irregular. The pupils measured $\frac{17}{50}$ths × $\frac{17}{50}$ths of an inch.

On the third day, the cardiac impulse was at the rate of 37, and the respirations (now pretty regular), were at that of 24 in ten seconds; and the pupils measured $\frac{15}{50}$ths × $\frac{15}{50}$ths of an inch.

On the fifth day, the cardiac impulse was at the rate of 40, and the respirations were at that of 23, in ten seconds; and the pupils measured $\frac{14}{50}$ths × $\frac{13}{50}$ths of an inch. By this time, therefore, every appreciable effect of the experiment had disappeared.

On the ninth day, a dose of extract, weighing only one-third of that which had been given in this experiment, was administered to the same rabbit; and the results of this administration will now be described.

EXPERIMENT **42-b**.—The rabbit now weighed three pounds and five ounces; and immediately before the administration, the rate of the heart's impulse was 42, and that of the respirations 21, in ten seconds. One grain and three-tenths of extract of physostigma was mixed with 20 minims of distilled water, and the mixture injected under the skin at the right flank. The syringe was then washed out with a few drops of distilled water, and the washing in its turn injected under the skin at the right hip. Within one minute and thirty seconds thereafter, faint fibrillary twitchings occurred, at rare intervals, at the right flank. These gradually increased in frequency, until they became a prominent symptom, within four minutes from the commencement of the injection. At this time, the heart's rate had diminished to 33 in ten seconds; but the

respirations still retained their previous frequency. In six minutes, the rate of the heart's impulse was 28, and that of the respirations 21, in ten seconds; the fibrillary twitches had become rather more frequent and marked; and movements of the mouth and lips occurred, which were of such a kind as to suggest that some substance was being moved from the anterior part of the mouth and swallowed. There was no other symptom present, and the rabbit sat quietly on the elevated table on which it had been placed. In eight minutes, however, uneasiness was manifested by some restless movements, which at first were somewhat unsteadily performed, and by-and-by were attended with stumblings and occasional slight tremors. The latter symptoms appeared to be caused by an undue extension rather than by flaccidity of the limbs. In ten minutes, the four limbs were in almost complete extension, and the rabbit either stood unsteadily, or went about stiffly and with stumblings on the limbs thus extended. The pupils measured $\frac{15}{50}$ths × $\frac{15}{50}$ths of an inch; and moist sounds frequently accompanied the slightly accelerated respiratory movements. No marked change occurred in the condition of the rabbit for several minutes; but at fourteen minutes after the injection, the extended state of the anterior extremities had almost entirely disappeared, and the thorax not infrequently rested on the table, while the pelvis and posterior parts of the body were elevated on the still extended posterior extremities. The pupils had now contracted to $\frac{11}{50}$ths × $\frac{11}{50}$ths of an inch, and the heart's rate had decreased to 22 beats in ten seconds. In eighteen minutes, the rabbit lay on the abdomen and chest, with the head drooping, and occasionally resting on the table; the respirations occurred 25 times in ten seconds, and were accompanied with noisy bubbling sounds; frothy saliva was escaping from the mouth; and fæces, of a green colour and semi-liquid consistence, were being passed. Soon, the respiratory movements became laboured, less frequent, and often greatly obstructed by accumulations of frothy fluid in the mouth and air-passages; and the rabbit was extended on the abdomen, with the head resting on the table, from which it was raised, though with difficulty, whenever the respiratory movements were much impeded. In twenty minutes, some general struggling movements occurred, obviously due to obstructed respiration, and the rabbit fell over on the side. The cardiac impulses were now at the rate of 18 in ten seconds; the pupils measured $\frac{6}{50}$ths × $\frac{5}{50}$ths of an inch; and the fibrillary twitchings were very frequent, and affected the whole surface of the animal. The difficulty in the performance of the respiratory movements gradually became greater, until, in twenty-nine minutes, only one very laboured, gasping respiration occurred every ten seconds. Soon afterwards, two or three series of weak tremors affected the animal, and at the termination of the last of these the respirations altogether ceased, and death took place—thirty-one minutes after the commencement of the first injection.

At the moment of death, the pupils measured $\frac{6}{50}$ths × $\frac{5}{50}$ths of an inch; three minutes afterwards, their size had increased to $\frac{7}{50}$ths × $\frac{7}{50}$ths of an inch; and this increase gradually became greater until one hour and thirty minutes, when they measured $\frac{11}{50}$ths × $\frac{11}{50}$ths of an inch.

The first appearance of *post mortem* rigidity was observed at thirty-two minutes after death, and it consisted of a very slight degree of stiffness restricted to the posterior extremities. The rigidity next appeared in the anterior extremities and the neck, and finally it became universal, but not until one hour and fourteen minutes after death. (Temperature of laboratory, 56° F.)

A considerable quantity of opalescent urine was removed from the bladder, and when tested it was found that the opalescence was due to suspended phosphates, and that the urine was perfectly free from albumen.

In the next experiment, in place of extract of physostigma, the sulphate of the active principle was administered.

Experiment **43-a.**—In a rabbit weighing three pounds, it was found that the rate of the heart's impulse was 44, and that of the respirations 15, in ten seconds, and that the pupils measured $\frac{14}{50}$ths × $\frac{13}{50}$ths of an inch.

A solution containing half a grain of sulphate of atropia in 15 minims of distilled water was injected under the skin at the right flank. In one minute afterwards, the rate of the heart's impulse was 47 in ten seconds; in one minute and thirty seconds, the respirations occurred 22 times in ten seconds; in two minutes, the pupils measured $\frac{15}{50}$ths × $\frac{15}{50}$ths of an inch; in three minutes, the rate of the heart's impulse was 53 in ten seconds; in three minutes and thirty seconds, the respirations occurred 21 times in ten seconds; and in four minutes, the rate of the heart's impulse was 55 in ten seconds, while the pupils measured $\frac{16}{50}$ths × $\frac{16}{50}$ths of an inch.

Five minutes after the sulphate of atropia had been injected, a solution containing six twenty-fifths of a grain of sulphate of physostigmia in 25 minims of distilled water was injected under the skin at the right flank, and then the syringe was washed out with a few minims of distilled water, which was injected under the skin at the right hip—the entire operation occupying thirty seconds. The first symptom that followed was the occurrence of infrequent and slight twitches of small portions of the *panniculus carnosus* muscle, in the neighbourhood of the regions where the two last injections were made. These twitches were first observed one minute and twenty seconds after the commencement of these injections of physostigmia, and they gradually extended over the surface of the animal, until in three minutes they had become general. In four minutes, the rate of the heart's impulse was 49, and that of the respirations 21, in ten seconds; and the pupils now measured $\frac{18}{50}$ths × $\frac{18}{50}$ths of an inch. At this time, also, the respiratory movements were often accompanied with a hiccup-like start. In six minutes, the rate of the heart's impulse had

decreased to 42 in ten seconds; and now the rabbit was affected with occasional tremblings, restlessness was present, and the movements were somewhat impeded by a slight degree of extension of the anterior extremities. In eight minutes, urine and fæces were voided, the latter having a perfectly normal appearance, tremors were of frequent occurrence, and the fibrillary twitchings had become greatly exaggerated, the entire surface of the animal being in constant movement. In ten minutes, the extension of the limbs had given place to undue flaccidity, so that they could scarcely support the body; weak general tremors succeeded each other at intervals; the muscles of the neck seemed unable properly to support the head, which often subsided until the lower jaw nearly rested on the table; the respirations occurred 30 times in ten seconds; and the pupils measured $\frac{1}{50}$ths × $\frac{1}{50}$ths of an inch. In seventeen minutes, the animal fell on the abdomen and chest, and remained in this position. Tremors still occurred, though weaker and less frequent than before, and the fibrillary twitching of the *panniculus carnosus* muscle had rather diminished; but it was apparent that similar twitchings were occurring in the deeper muscles. In twenty-two minutes, the lower jaw was rested on the table, and the arching of the back had almost disappeared. Attempts were made to count the heart's impulse, but when the hand was placed on the animal, tremors so severe and continuous were excited that it was impossible to ascertain the rate with accuracy. In twenty-five minutes, the general weakness had still further increased, so that the limbs were extended helplessly at right angles to the body, and the side of the head was resting on the table. The respirations were now 20 in ten seconds, the pupils measured $\frac{1}{50}$ths × $\frac{1}{50}$ths of an inch, and the fibrillary twitches had become less prominently marked. In thirty minutes, a slight improvement was manifested in the condition of the animal, for spontaneous tremors but rarely occurred, nor were they excited in their former severity when the hand was placed on the body. It was therefore possible to count the heart's impulses, which were ascertained to occur 41 times in ten seconds. A general improvement was still more distinctly perceived at forty minutes after the injection of physostigmia, when the head was now and then quietly elevated, and attempts were made to raise the body from the table. The latter were at first unsuccessful, but at forty-nine minutes the rabbit succeeded in rising, and at once assumed a perfectly normal posture. In fifty-two minutes, several fæcal pellets of natural appearance were passed; the heart's impulse was at the rate of 36, and the respirations were at that of 22, in ten seconds; the fibrillary twitchings were pretty well marked; and the rabbit was able to go about, though with considerable difficulty. After this, the animal usually sat quiet in a normal attitude, and in a short time it was able to go about without any perceptible difficulty. In one hour and thirty minutes, a great number of large fæcal pellets were passed, which were of a somewhat pultaceous consistence. At this time, the rate of

the heart's impulse was 36, and that of the respirations 19, in ten seconds; the pupils measured $\frac{17}{50}$ths × $\frac{17}{50}$ths of an inch, and distinct fibrillary twitchings were still present; with these exceptions, the animal was in a perfectly normal state.

On the following day—at twenty-six hours after the injection of physostigmia—the rabbit was active and well; and it was observed that, since the last note, a considerable quantity of pultaceous fæces had been passed. The rate of the heart's impulse was 32, and that of the respirations 15, in ten seconds; and the pupils measured $\frac{17}{50}$ths × $\frac{17}{50}$ths of an inch.

By the fourth day, a normal rate of the cardiac contractions and respiratory movements, and a normal condition of the pupils, had been reassumed.

On the tenth day, the rabbit was found to weigh three pounds and half an ounce; and it was then made the subject of the following experiment:—

Experiment **43-b.**—Having dissolved six twenty-fifths of a grain of sulphate of physostigmia in 25 minims of distilled water, I injected the solution under the skin at the right flank, and then washed the syringe with a few drops of distilled water, and injected this water under the skin at the right hip. Before this experiment was commenced, the rate of the cardiac impulse was 42, and that of the respirations 19, in ten seconds; and the pupils measured $\frac{14}{50}$ths × $\frac{13}{50}$ths of an inch.

In one minute and thirty seconds after the commencement of the administration, rare fibrillary twitches occurred near the regions of injection; but no marked general symptoms appeared until four minutes and forty seconds, when the limbs, especially the two anterior, became extended. The animal then went about unsteadily, and with considerable difficulty; and the rate of the cardiac impulses was 37 in ten seconds. In six minutes, some fæcal pellets were passed; tremors occurred almost without intermission; stumbling and somewhat excited movements were made; and the extended state of the limbs disappeared, and the rabbit subsided on the abdomen and chest. These symptoms rapidly became more and more serious; the pupils contracted to $\frac{7}{50}$ths × $\frac{6}{50}$ths of an inch; general paralysis became well marked; frequently-recurring tremors, weaker now than before, impeded the respiratory movements, and saliva escaped from the mouth. In eight minutes, the respirations consisted of mere gasps, laboured in their character, and greatly obstructed by mucus, while the rate of the cardiac impulses had become diminished to 13 in ten seconds. Soon afterwards, only rarely-occurring gasps were observed, and it was impossible to detect any cardiac impulse. The former ceased on the occurrence of death, nine minutes and fifty seconds after the commencement of the injection.

At the moment of death, the pupils measured $\frac{5}{50}$ths × $\frac{4}{50}$ths of an inch, and they slowly increased in size until, at forty-one minutes after death, they

measured $\frac{10}{50}$ths × $\frac{2}{50}$ths of an inch; and now, for the first time, *post mortem* rigidity had been initiated, slight stiffness being present in the posterior extremities (temperature of laboratory, 58° F.)

It is very obviously shown by these experiments that the fatal action of certain lethal doses of extract of physostigma, and sulphate of physostigmia, may be prevented in rabbits by the previous administration of atropia.

Atropia and Physostigma simultaneously administered.—In the two following experiments, extract of physostigma and sulphate of atropia were administered simultaneously, or nearly so, only an unavoidable interval of a few seconds intervening between the administration of the two substances.

Experiment 44-a.—In a rabbit that weighed three pounds and twelve ounces, I injected under the skin of the left flank half a grain of sulphate of atropia, dissolved in 15 minims of distilled water, and immediately afterwards three grains of extract of physostigma, suspended in 28 minims of distilled water. Without any loss of time, the two syringes employed in these injections were washed out with a few drops of distilled water, and the washings were separately injected under the skin at different regions.

Except dilatation of the pupils and fibrillary twitches of the muscular structure beneath the skin, obvious symptoms were but slowly produced, and it was not until eleven minutes after the injections had been finished that paralytic effects were produced. These effects, however, increased in severity somewhat quickly, and in fifteen minutes the rabbit fell over on the side, though it soon turned again, and lay on the abdomen and chest with the back well arched. At this time, the pupils were in full dilatation, fibrillary twitches occurred over the whole surface of the animal, and fæces of normal consistence and colour were passed, while now and again a spasmodic contraction of the abdominal muscles accompanied the inspiratory movements. Unsuccessful efforts were frequently made to raise the body on the limbs, and often resulted in the production of general tremors, during which the rabbit several times fell over on the side. This state of great muscular weakness, attended with well marked fibrillary twitches of the *panniculus carnosus* muscle, and apparently also of muscles more deeply situated, continued, without any improvement, until one hour and ten minutes after the commencement of the experiment, when further observations were interrupted.

On the following day the general state of the rabbit appeared a perfectly normal one. The pupils were, however, in full dilatation, and it was observed that a large quantity of semi-liquid fæces had been passed.

On the third day the fæces that were passed were in every respect normal. Dilatation of the pupils was still present, and this, the most persistent of the symptoms, did not disappear until the sixth day.

On the tenth day, the following experiment was performed; the rabbit

being perfectly well, and weighing three pounds and twelve ounces and a half.

EXPERIMENT **44-b.**—I injected one grain and a half of extract of physostigma, suspended in 15 minims of distilled water, under the skin at the right flank, and immediately afterwards washed out the syringe and injected the washings under the skin at the right hip. Effects were produced in every essential character analogous to those that have been described as occurring in the preceding experiments with the extract, and in fifteen minutes the animal was lying on the abdomen and chest. At this time the only noteworthy symptoms were an unusually abundant escape of saliva from the mouth, and a remarkable frequency in the voiding of pultaceous fæces. In twenty-three minutes the rabbit fell over on the side, and while it remained in this position the respirations were laboured and greatly obstructed by mucus accumulated in the larynx and air passages, the pupils were contracted, and the cardiac impulses of infrequent occurrence. In twenty-five minutes a marked improvement occurred in the general condition of the rabbit; it turned so as to rest on the abdomen and chest, the head was frequently raised, and the respirations became more frequent and almost free from obstruction. This improvement was, however, of but short duration, for in forty minutes the respirations again became embarrassed, tremors and irregular and somewhat energetic general movements occurred, and the rabbit again fell over on the side. Gradually the respiratory movements became less frequent, frothy saliva escaped from the mouth and accumulated in the larynx, the pupils diminished in size, and the heart's impulses became feeble and infrequent. Soon afterwards the respirations assumed the character of laboured gasps, greatly impeded by an abundant accumulation of frothy mucus, and they finally ceased at fifty-four minutes after the injection of the extract.

EXPERIMENT **45-a.**—In a young rabbit weighing two pounds and eight ounces, I injected half a grain of sulphate of atropia, dissolved in 15 minims of distilled water, under the skin at the right flank, and then one grain of extract of physostigma, suspended in 15 minims of water, under the skin at the left flank. Immediately afterwards the water used in washing out each of the syringes was injected under separate parts of the skin.

Before the experiment the pupils measured $\frac{12}{50}$ths × $\frac{11}{50}$ths of an inch, and in two minutes after the commencement of the first injection they had enlarged to $\frac{15}{50}$ths × $\frac{15}{50}$ths of an inch, while slight fibrillary twitches were observed at the right side in the immediate neighbourhood of the regions where physostigma had been injected. In seven minutes the rabbit became restless; in thirteen minutes the pupils had still further enlarged to $\frac{16}{50}$ths × $\frac{16}{50}$ths of an inch; and in fourteen minutes several fæcal pellets were passed, and the fibrillary twitches were more marked, and occurred over the whole surface of

the animal. With these exceptions, the rabbit appeared to be in a normal state, until eighteen minutes after the commencement of the injections, when symptoms of loss of power occurred in the thoracic extremities; but these symptoms did not become severe until twenty-five minutes, when stumbling movements were made, and soon after the rabbit subsided on to the abdomen and chest. It remained quietly in this attitude, with the head normally raised, for about eight minutes, and then rose up and stood or went about somewhat unsteadily. A large additional quantity of fæces having a normal character was passed, and some urine voided. Soon afterwards the partial paralysis was recovered from, and at forty-five minutes there were no marked general symptoms present, except a dilated state of the pupils and fibrillary twitches. A perfect recovery ultimately occurred.

Thirteen days afterwards the following experiment was performed on this rabbit, which then weighed two pounds and nine ounces.

EXPERIMENT **45-b.**—One grain of extract of physostigma, mixed with 15 minims of distilled water, was injected under the skin at the right flank, and immediately afterwards the syringe was washed out with a few drops of distilled water, and this too was injected under the skin.

The phenomena usually produced by such a dose occurred in their ordinary sequence: fibrillary twitches, stiff extension of the limbs succeeded by their partial paralysis, slight tremors, unimportant and transient dilatation followed by marked contraction of the pupils, defæcation, excessive flow of saliva, and then a state of general flaccidity, interrupted now and then by laboured and gasping respirations. In eighteen minutes after the injection of the extract the rabbit was dead.*

Physostigma administered before Atropia.—It is evident, therefore, that atropia is able to prevent the occurrence of death after lethal doses of physostigma, if the two substances be simultaneously administered. The influence that it exerts on the lethal action of physostigma when administered after the dose of this substance is shown by the following experiments. In the first of these, the extract of physostigma was employed.

EXPERIMENT **46-a.**—Having ascertained, in a rabbit weighing three pounds and two ounces, that the average rate of the cardiac contractions was 40, and

* As has been frequently noticed in similar experiments, the bladder of this rabbit contained a large quantity of urine. I endeavoured to ascertain whether physostigma is excreted by the kidneys, by the following process:—About two ounces of this urine was evaporated at a low temperature on a water bath, and the residue carefully mixed with a little rectified spirit, and the mixture was then filtered, and in its turn evaporated to dryness at a low temperature. Then the extract thus obtained was triturated with a very little distilled water, and a drop of the resulting fluid was applied to the right eyeball of a rabbit, it having been previously ascertained that both pupils measured $\frac{1}{20}$ths × $\frac{1}{20}$ths of an inch. The pupils were carefully measured at frequent intervals during the following hour and twenty minutes, and it was found that no change occurred in the size of either. It is therefore highly improbable that the physostigma is excreted by the kidneys.

of the respirations 27, per ten seconds, and that the pupils measured $\frac{18}{50}$ths × $\frac{18}{50}$ths of an inch, I injected two grains and a half of extract of physostigma, suspended in 30 minims of distilled water, under the skin of the right flank, and immediately afterwards the washings of the syringe under the skin at the right hip. Two minutes thereafter, the respirations were at the rate of 28 per ten seconds, and infrequent fibrillary twitches occurred at the right side. The animal became slightly restless and appeared uncomfortable. In four minutes the cardiac impulse was at the rate of 30 in ten seconds, but the pupils were unchanged in size.

Five minutes after the commencement of the physostigma injection, half a grain of sulphate of atropia, dissolved in 15 minims of distilled water, was injected under the skin at the left flank, and the washings of the syringe under the skin at the left hip. In one minute after the injection of atropia, the pupils had increased to the size of $\frac{13}{50}$ths × $\frac{13}{50}$ths of an inch, and movements of the lips and mouth, symptomatic of the action of physostigma, were being made. In two minutes, the rate of the cardiac action had increased to 45 in ten seconds, and the fibrillary muscular twitches had become frequent and general over the whole surface of the rabbit; and in four minutes, the size of the pupils had still further increased to $\frac{17}{50}$ths × $\frac{17}{50}$ths of an inch, while the movements of the lips referred to still continued. In eight minutes, the rabbit was sitting normally, though with some slight shaking, the heart's rate was 51 in ten seconds, and the fibrillary muscular twitches had become greatly exaggerated. It was not until fifteen minutes after the administration of atropia, and therefore twenty minutes after that of physostigma, that distinct symptoms of paralysis manifested themselves, and they consisted of merely a slight yielding of the forelimbs during the movements, and a little drooping of the head. At this time the respirations were at the rate of 22 per ten seconds, and the heart's action was very frequent, though it was impossible to ascertain its rate with accuracy, on account of the incessant recurrence of the fibrillary muscular twitches. These various symptoms continued unchanged until twenty-five minutes after the administration of atropia, when the paralytic symptoms became more marked, for whenever the animal attempted to go about it stumbled, and occasionally even fell on the abdomen. It was seen that the pupils had now diminished in size to $\frac{14}{50}$ths × $\frac{14}{50}$ths of an inch. In forty-five minutes a large quantity of urine was voided; in fifty minutes, the pupils measured $\frac{13}{50}$ths × $\frac{13}{50}$ths of an inch, and normal respiratory movements occurred at the rate of 26 in ten seconds; and in one hour several large and somewhat soft fæcal pellets were passed. There was not, as yet, any decided change in the general state of the animal; stumbling occurred when movements were made, and although a normal sitting posture could be assumed, there was distinct drooping of the head while this posture was being maintained. Now, however,

the fibrillary muscular twitches had somewhat diminished, and accordingly it was possible to ascertain with certainty that the rate of the cardiac contractions was 44 per ten seconds. In one hour and ten minutes a little moisture was seen at the mouth, and soon afterwards moist sounds occasionally accompanied the respiratory movements. It was observed, at this time, that the two pupils had become unequal in size, the right measuring, in full light, $\frac{12}{50}$ths × $\frac{12}{50}$ths, and the left $\frac{14}{50}$ths × $\frac{14}{50}$ths, of an inch. In one hour and fifteen minutes the animal went about quite steadily; there was no drooping of the head; the respirations were frequent and no longer accompanied with moist sounds; the cardiac contractions were at the rate of 35 in ten seconds; and several soft and wet fæcal pellets were passed, and a little urine was voided. The accumulation of mucus in the larynx had not, however, been entirely got rid of; for, every now and then, a curious discordant sound, cough-like in its character, was heard, which was unmistakably caused by an effort to get rid of some soft substance in the larynx. In two hours these sounds had altogether ceased; the rate of the cardiac impulses was 41, that of the respiratory movements 22, per ten seconds; and the size of the right pupil was $\frac{10}{50}$ths × $\frac{10}{50}$ths, and of the left $\frac{13}{50}$ths × $\frac{13}{50}$ths of an inch. But with the exception of infrequently occurring fibrillary twitches, there was no obvious symptom present.

On the following day—twenty-seven hours after the commencement of the experiment—the rabbit seemed to be perfectly well. The cardiac contractions were occurring at the rate of 31, and the respiratory movements at that of 19, in ten seconds; and the pupils were still unequal, the right measuring $\frac{13}{50}$ths × $\frac{13}{50}$ths, and the left $\frac{14}{50}$ths × $\frac{14}{50}$ths of an inch.

On the third day the most notable change that had occurred was in the rate of the cardiac contractions, which had by that time reassumed a normal rate of 41 in ten seconds. It was not, however, until the seventh day, that the pupils had resumed their previous size of $\frac{10}{50}$ths × $\frac{10}{50}$ths of an inch.

On the twelfth day the rabbit was in a state of vigorous health; its weight was three pounds and two ounces and three quarters; the rate of the heart's contractions was 41, and that of the respirations 18, in ten seconds; and the pupils measured $\frac{11}{50}$ths × $\frac{10}{50}$ths of an inch.

Experiment **46-b.**—Two minutes after the last observations had been made, the rabbit received, by subcutaneous injection, two grains and a half of extract of physostigma. In three minutes and thirty seconds the rate of the cardiac impulses had fallen to 36 in ten seconds; the respirations were normal, and there were no general symptoms except infrequent fibrillary twitches and movements of the lips and mouth. In four minutes and forty seconds, however, the limbs became extended; and in seven minutes stumbling movements were made, while a slight increase in the size of the pupils was

observed. In eight minutes a series of tremors occurred, which were frequently repeated until the animal, in nine minutes, sank down on the abdomen and chest. At this time, the rate of the heart's contractions was only 19 in ten seconds, and the respirations were considerably diminished in frequency, and somewhat laboured, obstruction being apparently caused by mucus accumulated in the mouth and throat. Very soon afterwards the embarrassment of the respiratory movements became greater, to such an extent that each respiration was accompanied by energetic struggling movements of the whole body; and in eleven minutes they assumed a gasping character. In eleven minutes and thirty seconds the head was drawn back, and a few slight tremors occurred, after which the rabbit was dead.

The first appearance of rigor, consisting of slight stiffness of the posterior extremities, occurred twenty-four minutes after death (temperature of laboratory, 58° F.).

I shall now describe, but with less minuteness, three other experiments, where the administration of atropia was preceded by the administration of a lethal dose of extract of physostigma, and where the interval of time separating the administration of the two substances was greater than in the last experiment.

Experiment **47-a.**—Two grains of extract of physostigma, previously suspended in 20 minims of distilled water, was injected under the skin at the right flank of a rabbit weighing three pounds and eleven ounces and a half. In eight minutes, the rabbit was lying on the abdomen and chest, saliva was escaping abundantly from the mouth, the pupils were somewhat contracted, the respirations were noisy and laboured, and moist fæces were being copiously passed.

At eight minutes and thirty seconds, half a grain of sulphate of atropia, dissolved in 15 minims of distilled water, was injected under the skin at the left flank. In four minutes afterwards the pupils were dilated and the flow of saliva and passage of fæces had ceased. In six minutes vigorous efforts were made to rise; but these were not successful until fifteen minutes. In about one hour and twenty minutes, the rabbit was nearly well, though a slight degree of paralysis was still present. In one hour and forty minutes, every obvious symptom had disappeared, except dilatation of the pupils and fibrillary twitches of the muscles.

Experiment **47-b.**—Four days afterwards, this rabbit, while in a perfectly normal condition, received, by subcutaneous injection, one grain and a half of extract of physostigma, suspended in 15 minims of distilled water. Tremors, paralysis, and great increase of the salivary and bronchial mucus secretions, were quickly produced; moist fæces were, by-and-by, evacuated in large quantity; the pupils became contracted; and death occurred fifteen minutes and thirty seconds after the administration.

In the next experiment, an interval of ten minutes and thirty seconds was allowed to intervene between the administration of the two substances.

EXPERIMENT **48-a**.—A young rabbit, weighing two pounds and fourteen ounces, received, by subcutaneous injection, one grain and a half of extract of physostigma, suspended in 15 minims of distilled water. Symptoms of physostigma action appeared in one minute and thirty seconds; but they did not assume a serious aspect until six minutes after the administration, when the rabbit had great difficulty in maintaining a sitting posture. In nine minutes, it fell, and rested on the abdomen, chest, and lower jaw. In ten minutes, fæces were passed, and saliva escaped from the mouth; while the animal lay flaccidly, quite unable to move about, and, every now and then, was affected with tremors.

At ten minutes and thirty seconds, half a grain of sulphate of atropia, dissolved in 15 minims of distilled water, was injected under the skin at the left flank. No obvious result occurred until four minutes and thirty seconds, when the state of flaccidity somewhat lessened, the back becoming normally curved. A few seconds afterwards, the head was again raised, the flow of saliva was considerably diminished, and the pupils were slightly dilated. In eight minutes the rabbit succeeded in rising, and it then sat in a natural posture. At this time, the exaggerated secretion of saliva had become completely checked, and the pupils widely dilated.

EXPERIMENT **48-b**.—Twelve days afterwards, one grain and a fifth of extract of physostigma was suspended in 15 minims of distilled water, and injected under the skin of this rabbit. Death occurred in thirty minutes.

In the following experiment, likewise, extract of physostigma was administered ten minutes and thirty seconds before atropia.

EXPERIMENT **49-a**.—Having suspended one grain and a half of extract of physostigma in 20 minims of distilled water, I injected it under the skin at the right flank of a strong white rabbit, whose weight was three pounds and three ounces. Ten minutes thereafter the rabbit was suffering from an advanced stage of physostigma poisoning. It was lying, unable to make any movements, except irregular struggles; saliva was freely escaping from the mouth; fæces were being passed; the entire surface of the animal was affected with fibrillary twitches; and the pupils were contracted to $\frac{6}{50}$ths × $\frac{5}{50}$ths of an inch, their size before the injection having been $\frac{11}{50}$ths × $\frac{11}{50}$ths of an inch.

At ten minutes and thirty seconds, I injected half a grain of sulphate of atropia, dissolved in 15 minims of distilled water, under the skin at the left flank. In three minutes after the administration of atropia, the pupils measured $\frac{3}{50}$ths × $\frac{2}{50}$ths of an inch, and loud mucous sounds accompanied the respirations. In six minutes, however, a decided improvement occurred, as the rabbit got up and went about, though with considerable difficulty, and in a hurried and excited manner. It was only at rare periods that mucous sounds were heard

with the respirations; the exaggerated flow of saliva ceased; and the pupils became enlarged to $\frac{8}{50}$ths × $\frac{7}{50}$ths of an inch. This improved state gradually became more decided, until at thirty-seven minutes after the injection of atropia, the rabbit seemed to have recovered from every abnormal symptom, except that extremely well-marked fibrillary twitches and dilatation of the pupils to the extent of $\frac{16}{50}$ths × $\frac{16}{50}$ths of an inch were present. At about one hour and thirty minutes, unmistakable symptoms of general physostigma poisoning somewhat unexpectedly again manifested themselves. Fæces, normal at this time in their characters, were passed; the pupils contracted to $\frac{12}{50}$ths × $\frac{12}{50}$ths of an inch, and saliva appeared at the mouth. In one hour and forty minutes, the respirations were constantly accompanied with mucous sounds; soft and, now and again, semi-liquid fæces were passed, and urine was voided; the surface of the eye-balls became unnaturally moist; the pupils measured only $\frac{11}{50}$ths × $\frac{18}{50}$ths of an inch; and the animal lay on the abdomen and chest, apparently unable to go about. However, an improvement in the general condition again occurred at two hours and twenty minutes; and from this time the symptoms became less and less severe, until a perfectly normal condition was established.

Experiment **49–b.**—Nine days afterwards this rabbit, being in a state of vigorous health, and having a weight of three pounds and five ounces, received, by subcutaneous injection, one grain and three-tenths of extract of physostigma. In thirty-four minutes thereafter it was extended on the side; infrequent, laboured, and noisy respiratory gasps were occurring; soft and almost liquid fæces were being passed, along with which there were occasionally some small pieces of a clear jelly-like substance; the cardiac contractions were occurring at a very reduced rate of frequency; and the pupils were in extreme contraction. In forty-six minutes and ten seconds after the administration of physostigma, the rabbit was dead.

In two other experiments that will now be described, physostigma was administered in the form of sulphate of the active principle, and between the administration of the two substances a period even longer than that in the last experiment intervened.

Experiment **50–a.**—In a rabbit, weighing three pounds and ten ounces, the average rate of the cardiac contractions was found to be 38, and that of the respiratory movements 22, in ten seconds; while the pupils measured $\frac{11}{50}$ths × $\frac{18}{50}$ths of an inch. A solution, containing nine-fifteenths of a grain of sulphate of physostigmia in 20 minims of distilled water, was injected under the skin at the right flank, and, immediately afterwards, the syringe was washed with a few drops of distilled water, and this water was injected under the skin at the right hip. The following symptoms then occurred, the time being computed from the moment when the first injection was commenced:–

	Cardiac Contractions, per 10 seconds.	Respirations, per 10 seconds.	Size of Pupils, in fractions of an inch.	General Symptoms, &c.
In 1 min. 30 sec.	—	19	—	Infrequent fibrillary twitches at right side.
4 „ .	32	14		
6 „ 30 „	29	—	$\frac{1}{5}\frac{2}{0}$ths × $\frac{1}{5}\frac{2}{0}$ths	Movement of lips commenced.
7 „ .	—	—	—	Slight restlessness and some extension of the limbs.
9 „ .	25	16	$\frac{1}{5}\frac{4}{0}$ths × $\frac{1}{5}\frac{4}{0}$ths	The extension of limbs more marked, and some unsteadiness and shaking.
11 „ .	—	—	—	Excited movements, and often stumbles, while series of tremors occur.
12 „ .	—	18	—	Head droops, the stiff extension of the limbs has given place to some flaccidity and weakness, and the fore limbs often give way. Somewhat soft fæces are passed.
14 „ .	14	—	$\frac{1}{5}\frac{1}{0}$ths × $\frac{1}{5}\frac{1}{0}$ths	The respirations are noisy, impeded by mucus, and laboured; and the animal lies on the abdomen and chest. Saliva escapes freely from the mouth.
15 „ .	9	—	$\frac{7}{5}\frac{7}{0}$ths × $\frac{7}{5}\frac{7}{0}$ths	The animal is on the side. Infrequent, laboured, and noisy respirations occur, which are accompanied with general struggles. The cardiac impulse is extremely weak.

At fifteen minutes and ten seconds after the commencement of the injection of sulphate of physostigmia, a solution containing seven-tenths of a grain of sulphate of atropia in ten minims of distilled water was injected under the skin at the back; and immediately afterwards, the syringe was washed and the few minims of water employed was injected under the skin at the right shoulder. After the commencement of these injections of sulphate of atropia, which were made while the animal appeared to be at the point of death, the following symptoms occurred :—

	Cardiac Contractions, per 10 seconds.	Respirations, per 10 seconds.	Size of Pupils, in fractions of an inch.	General Symptoms, &c.
In 1 min. 30 sec.	—	7	$\frac{7}{5}\frac{7}{0}$ths × $\frac{7}{5}\frac{7}{0}$ths	
2 „ .	50	18	$\frac{8}{5}\frac{8}{0}$ths × $\frac{8}{5}\frac{8}{0}$ths	The cardiac impulse is strong.
4 „ .	52	18	$\frac{1}{5}\frac{5}{0}$ths × $\frac{1}{5}\frac{5}{0}$ths	Still on side. The respirations are almost normal in character, and now unaccompanied with moist sounds. Fibrillary muscular twitches very frequent, and occurring over the whole surface. Now and then some spasmodic tremors.
7 „ .	59	—	—	The tremors are less frequent, and the head is occasionally raised.

	Cardiac Contractions, per 10 seconds.	Respirations, per 10 seconds.	Size of Pupils, in fractions of an inch.	General Symptoms, &c.
In 9 min. 30 sec.	61	19	$\frac{17}{50}$ths × $\frac{17}{50}$ths	Saliva has ceased to flow from the mouth.
11 „ 30 „	—	—	—	Has succeeded in turning from side, and is now lying on the abdomen and chest, with the lower jaw resting on the table.
20 „ .	—	20	—	Moist sounds occasionally accompany the respirations. Efforts are made to arch the back. Fibrillary twitches have become so frequent that it is impossible to count the cardiac impulses, but they are ascertained to be very frequent.
25 „ .	—	21	$\frac{17}{50}$ths × $\frac{17}{50}$ths	The back is now arched, but the lower jaw still rests on the table, and the anterior extremities are extended flaccidly at right angles to the body.
30 „ 30 „	61	16	—	The fibrillary twitches are less marked.
36 „ .	—	—	$\frac{17}{50}$ths × $\frac{18}{50}$ths	The rabbit got up and walked a short distance slowly and unsteadily. The transverse diameter of the pupils is greater than the perpendicular.
60 „ .	50	19	$\frac{17}{50}$ths × $\frac{18}{50}$ths	Now and then the rabbit goes about with great difficulty, but usually rests quietly on the abdomen and chest. At rare intervals moist sounds accompany the respirations.
120 „ .	—	—	—	There is only a little difficulty present when the rabbit goes about. It usually sits normally, with slight drooping of the head. The fibrillary twitches are prominently marked.
160 „ .	42	11	$\frac{16}{50}$ths × $\frac{17}{50}$ths	The general condition remains as last noted, except that the fibrillary twitches are now only slightly marked. Neither defæcation nor urination have occurred since the injection of the atropia.

On the following day—twenty-three hours after the commencement of the experiment—the rabbit was lively and well. It was ascertained that the cardiac impulses occurred at the rate of 28, and the respiratory movements at that of 9, in ten seconds. The pupils measured $\frac{15}{50}$ths × $\frac{16}{50}$ths of an inch.

On the fourth day, the restoration of every affected function to a normal state appeared to have been perfected; for now the cardiac contractions and the respiratory movements had returned to their usual rate of 39 and 22 in ten seconds, while the pupils measured $\frac{11}{50}$ths × $\frac{13}{50}$ths of an inch, which exactly corresponded to their measurement before this experiment was made.

Experiment **50-b**.—On the tenth day this rabbit received, by subcutaneous injection, nine-fiftieths of a grain of sulphate of physostigmia. It had previously

been ascertained that the weight of the animal was now three pounds and ten ounces and a half, that the pupils measured $\frac{10}{50}$ths × $\frac{9}{10}$ths of an inch, and that the cardiac contractions were at the rate of 38, and the respirations at that of 15, in ten seconds.

The phenomena usually produced by such a dose quickly made their appearance; among which may be noted a reduction in the rate of the heart's action to 29 in ten seconds, five minutes after the commencement of the administration. Stumbling and excited movements, accompanied with slight increase in the size of the pupils, were, by-and-by, succeeded by partial paralysis, accompanied with frequently recurring tremors, slight contraction of the pupils, noisy infrequent respirations, a flow of saliva from the mouth, and the passage of fæces. In thirteen minutes, the rabbit fell over on the side, the respirations were gasping and obstructed by mucus, the heart's contractions were at the greatly reduced rate of 14 in ten seconds, and the pupils measured only $\frac{7}{50}$ths × $\frac{6}{50}$ths of an inch. Nearly incessantly the limbs were moving in a to-and-fro direction, and occasionally they were affected by more vigorous spasmodic movements. In fifteen minutes and thirty seconds, it was impossible to discover any cardiac impulse, the respirations consisted of rarely occurring gasping movements, the pupils had contracted to $\frac{6}{50}$ths × $\frac{5}{50}$ths of an inch, and the sensibility of the eyeballs had entirely disappeared. Only a few more gasps occurred, and in sixteen minutes after the commencement of the experiment the rabbit was dead.

After death, the first appearance of rigidity was detected in twenty-five minutes, but decided general rigor did not occur until the end of fifty-five minutes (temperature of laboratory 56° F.). At this latter period the pupils measured $\frac{11}{50}$ths × $\frac{10}{50}$ths of an inch.

In the next experiment, also, it is conspicuously shown that atropia is able to prevent the lethal action of physostigma even when its administration is deferred until death appears to be on the point of occurring.

Experiment **51-a**.—In a rabbit, weighing three pounds and eight ounces, it was ascertained that the rate, per ten seconds, of the heart's contractions was 40, and that of the respirations 20, and that the pupils measured $\frac{14}{50}$ths × $\frac{13}{50}$ths of an inch. The rabbit then received, by subcutaneous injection, seventeen-hundredths of a grain of sulphate of physostigmia. The following effects were noted:—

	Cardiac Contractions, per 10 seconds.	Respirations, per 10 seconds.	Size of Pupils, in fractions of an inch.	General Symptoms, &c.
In 1 min. 30 sec.	—	—	—	Slight fibrillary twitches at right side.
3 „ .	—	16	—	Twitches more frequent.
4 „ .	32	—	$\frac{14}{50}$ths × $\frac{13}{50}$ths	A little restlessness.
6 „ .	29	16	—	Movements of lips and mouth.
8 „ .	—	15	$\frac{15}{50}$ths × $\frac{14}{50}$ths	Limbs slightly extended. Shaking a little.

	Cardiac Contractions, per 10 seconds.	Respirations, per 10 seconds.	Size of Pupils, in fractions of an inch.	General Symptoms, &c.
In 10 min. .	—	—	—	Stumbles frequently. Wet fæcal pellets passed.
12 „	—	—	—	Pultaceous fæces passed. The fibrillary twitches are well marked and general. The rabbit is lying on the abdomen and thorax.
14 „ .	—	21	—	The respirations are often accompanied with mucous sounds. Saliva is escaping from the mouth.
17 „ .	—	22	$\frac{1}{5}\frac{2}{0}$ths × $\frac{1}{5}\frac{2}{0}$ths	Tremors occurred, and the rabbit fell on the side, but soon again lay on the abdomen and thorax.
20 „	—	18	$\frac{1}{5}\frac{1}{0}$ths × $\frac{1}{5}\frac{1}{0}$ths	Tremors occurred. Semi-liquid fæces were passed.
23 „ .	22	18	$\frac{1}{5}\frac{0}{0}$ths × $\frac{1}{5}\frac{0}{0}$ths	The respirations are considerably impeded by saliva and mucus. There is no arching of the back, and the lower jaw rests on the table.
26 „ .	19	17	$\frac{9}{5}\frac{}{0}$ths × $\frac{8}{5}\frac{}{0}$ths	The respirations are laboured, and now and again obstructed by mucus, which is removed only after energetic struggles. Rabbit has again fallen over on side, and is unable to turn itself. The fibrillary twitching is now only slight.
28 „ .	11	—	—	Only infrequent laboured respirations occurring at irregular intervals. The rabbit is lying on the side, and movements of the limbs accompany the respirations. The cardiac impulse is very weak.
28 „ 30 sec.	—	—	$\frac{7}{5}\frac{}{0}$ths × $\frac{5}{5}\frac{}{0}$ths	Infrequent and laboured gasps, greatly obstructed by mucus.

At twenty-nine minutes after the commencement of the injection of physostigmia, half a grain of sulphate of atropia was administered to the rabbit by subcutaneous injection, when the symptoms became modified in the following manner :—

	Cardiac Contractions, per 10 seconds.	Respirations, per 10 seconds.	Size of Pupils, in fractions of an inch.	General Symptoms, &c.
In 1 min. .	56	—	$\frac{6}{5}\frac{}{0}$ths × $\frac{5}{5}\frac{}{0}$ths	Rabbit is still on side. Weak struggling gasps occurring.
2 „ .	—	15	—	Respirations are no longer gasping, but they are still accompanied with mucous sounds.
3 „ .	58	—	—	Respirations are less noisy.
6 „ .	—	20	—	Respirations are regular and full, and only occasionally accompanied with moist sounds.
7 „ .	60	—	—	Fibrillary muscular twitches have again become prominent.

	Cardiac Contractions, per 10 seconds.	Respirations, per 10 seconds.	Size of Pupils, in fractions of an inch.	General Symptoms, &c.
In 8 min. .	—	15	$\frac{8}{60}$ths × $\frac{7}{60}$ths	Rabbit is still on the side, but usually quiet, except the shaking that is caused by the incessant fibrillary twitches.
10 „ .	61	—	—	Unsuccessful attempts are made to turn from the side.
11 „ .	—	16	$\frac{16}{60}$ths × $\frac{16}{60}$ths	The respirations are now quite free from mucous sounds. The incessant fibrillary contractions of the muscles cause twitches not only of the skin, but also of the toes, legs, ears, tail, and even eyeballs.
18 „ .	62	18	$\frac{16}{60}$ths × $\frac{16}{60}$ths	After many efforts, the rabbit succeeded in turning from the side.
21 „ .	—	—	—	Some efforts were made to raise the thorax on the anterior extremities, but these efforts excited a series of tremors, during which the rabbit fell on the side.
25 „ .	63	16	$\frac{16}{60}$ths × $\frac{16}{60}$ths	The rabbit has now turned from the side.
28 „ .	—	—	—	A normal sitting posture was assumed and maintained. There is, however, a little drooping of the head.
40 „ .	62	—	—	The rabbit walked about with only a little difficulty.
70 „ .	—	14	$\frac{16}{60}$ths × $\frac{16}{60}$ths	Occasionally some moist sounds are heard accompanying the respirations. There is still a decided degree of weakness present in the anterior extremities. The fibrillary twitches are still incessant in their occurrence.
100 „ .	40	14		The fibrillary twitches have diminished in frequency, but not in the generality of their occurrence, the eyeballs, ears, feet, &c., being still sometimes twitched.
126 „ .	—	—	$\frac{16}{60}$ths × $\frac{16}{60}$ths	The rabbit goes about without any unsteadiness. For the first time since the injection of atropia, some fæcal pellets were now passed, which are rather larger and slightly softer than normal pellets.
190 „ .	35	16	$\frac{16}{60}$ths × $\frac{16}{60}$ths	The general condition of the rabbit seems to be a perfectly normal one. It is only with difficulty that some rarely occurring fibrillary twitches can be detected. A few more fæcal pellets have been passed, but no urine has been voided since the commencement of the experiment.

On the following day this rabbit seemed to be in an absolutely normal condition. It fed largely, and went about actively and well. The pupils measured $\frac{16}{50}$ths × $\frac{16}{50}$ths of an inch, and the rate per ten seconds of the cardiac contractions

was 36, and that of the respiratory movements 18. No further observation was made until the seventh day, when it was found that the heart was contracting 41 times in ten seconds, that the respirations were occurring 20 times in ten seconds, and that the pupils measured $\frac{13}{50}$ths × $\frac{11}{50}$ths of an inch.

The usual testing experiment to prove that the animal had received a lethal dose of physostigma, was made on the ninth day; but in this instance a smaller dose was administered than that from which the animal had already recovered.

EXPERIMENT **51-b.**—Having ascertained that the rabbit which formed the subject of the preceding experiment now weighed three pounds five ounces and three quarters, I administered to it, by subcutaneous injection, thirteen one-hundredths of a grain of sulphate of physostigmia. In four minutes thereafter, the rate of the cardiac contractions had diminished to 34 per ten seconds, and in six minutes to 29 per ten seconds. At the latter time, the limbs of the animal were extended, and it stood or went about unsteadily with the body abnormally elevated. Soon afterwards, it became excited, and went about with hurried stumbling movements; and during these movements, it was found that the heart's action was accelerated to the rate of 44 in ten seconds. In fourteen minutes, pultaceous fæces were passed, moisture appeared at the mouth, frequent fibrillary twitches were occurring, and occasionally moist sounds accompanied the somewhat frequent respiratory movements. In seventeen minutes, the pupils were markedly contracted, and the rabbit lay on the abdomen and thorax. In twenty minutes, tremors frequently occurred, the respirations were now laboured and greatly obstructed by mucus and saliva, and the heart contracted only 16 times in ten seconds. The rabbit was dead in twenty-four minutes.

Immediately before death occurred, the pupils became dilated to $\frac{18}{50}$ths × $\frac{18}{50}$ths of an inch; and at the moment of death they became contracted to $\frac{6}{50}$ × $\frac{5}{50}$ths of an inch. After this, their size diminished to $\frac{4}{50}$ths × $\frac{4}{50}$ths of an inch, at one minute and thirty seconds; but soon afterwards, gradual dilatation set in, until they measured $\frac{6}{50}$ths × $\frac{5}{50}$ths of an inch, twenty-four minutes after death. At this time, *post mortem* rigor had appeared in the posterior extremities (temperature of laboratory, 58° F.)

In these various experiments, the influence exerted by atropia upon the action of physostigma is shown to be a most remarkable and conspicuous one, for it effectually counteracts the lethal activity of certain doses of physostigma, whether it be given within a certain time before, simultaneously with, or within a certain time after that substance.

Experiments on Dogs.—The experiments I have described, whereby the existence of this counteraction is demonstrated, were performed on rabbits. In the absence of proof to the contrary, and in the absence likewise of any reasonable grounds for entertaining a different opinion, I feel entitled to assume that this counteraction exists in all the species included in the higher subdivisions

of the animal kingdom. It was, therefore, with the greatest confidence as to the result that the following experiments on dogs were performed.

EXPERIMENT **52-a.**—I injected three-twentieths of a grain of sulphate of atropia, dissolved in 10 minims of distilled water, under the skin at the left flank of a cross-bred Spanish terrier, weighing eleven pounds; and the usual plan was followed of injecting immediately afterwards the washings of the syringe, so as to ensure that the whole of the dose mentioned should be introduced.

At five minutes after the commencement of this injection, a dose of nine-tenths of a grain of sulphate of physostigmia, dissolved in 30 minims of distilled water, was injected under the skin at the right flank, the syringe was washed out with a few drops of water, and this water was injected under the skin at the right hip.

In five minutes after the injection of physostigmia, the dog was lying quietly, apparently but little inconvenienced, and the pupils were dilated. Soon after, distinct fibrillary twitches were observed, a little discomfort was manifested, and quite suddenly the dog fell over on the side. A normal crouching posture was, however, soon assumed, but it was maintained for only a few minutes, and in eleven minutes the dog again fell on the side. A few feeble and unsuccessful efforts were made to turn, soon afterwards incessant tremors made their appearance, and the fibrillary twitches became greatly increased in their frequency and prominence. It was not until fifty minutes after the administration of physostigmia, that any decided evidence of an improvement in the general condition of the dog was observed. It now, however, appeared to take some interest in the events that were occurring near it, and when spoken to, elevated the ears and even slightly raised the head. In fifty-nine minutes, it got up and walked about the room slowly and unsteadily.

On the morning of the second day, the dog eat a large meal with evident satisfaction, and with the exception of some languor and of a slowness in the cardiac contractions, it appeared to be in a normal state. The pupils were now somewhat contracted.

EXPERIMENT **52-b.**—On the eleventh day—ten days after the performance of the previous experiment,—the dog, being active and well, and weighing eleven pounds and four ounces, received, by subcutaneous injection, three-tenths of a grain of sulphate of physostigmia dissolved in 20 minims of distilled water. Immediately before this injection, it was ascertained that the heart's contractions occurred at the rate of 23 in ten seconds.

The first obvious effect occurred in five minutes, and consisted in the production of fibrillary twitches. In seven minutes, fæces were passed; and soon afterwards, there was some unsteadiness in the movements, and gentle tremors and almost incessant movements of the lips and mouth took place.

In nine minutes, the dog lay down, but almost at once rose again, though with great difficulty; and now frothy saliva escaped from the mouth. In ten minutes, it was lying extended on the floor, with the head resting on the lower jaw. In eleven minutes, the head fell on the side, starts frequently occurred, the respirations were gasping, laboured, and obstructed by mucus, and well-marked fibrillary twitchings were present, which involved the whole surface of the animal, and seemingly the deeper muscles also. In thirteen minutes, the animal was altogether on the side, in a flaccid state. In fifteen minutes, the heart's contractions occurred at the rate of only 4 in ten seconds, and so long were the intervals between the feeble respiratory gasps that more than once it was thought to be dead. This event, however, did not occur until two minutes afterwards, or seventeen minutes after the commencement of the administration of physostigmia.

In the two next experiments, atropia and physostigma were injected nearly simultaneously.

Experiment **53-a.**—A vigorous English terrier dog, weighing ten pounds, received, by subcutaneous injection, eight grains of sulphate of atropia, dissolved in 80 minims of distilled water, and immediately afterwards, three grains of extract of physostigma, suspended in forty minims of distilled water. These injections, as well as those subsequently made, by which the washings of the syringes were introduced under the skin, occupied altogether two minutes.

The chief symptoms that appeared were dilatation of the pupils, partial paralysis, frequent vomiting, and hypnotism. Of these, the first continued for several days, and the two last for less than twenty-four hours. The partial paralysis was nearly completely recovered from in forty minutes, after which, the dog was in a perfectly normal condition, except that the pupils were in full dilatation and that a tendency to sleep was manifested.

Experiment **53-b.**—Three weeks afterwards, this dog being now ten pounds and two ounces in weight, received, by subcutaneous injection, eight grains of sulphate of atropia, and immediately afterwards six grains of extract of physostigma.

Dilatation of the pupils and considerable loss of motor power were again produced, but no vomiting occurred. In addition to these symptoms, however, certain others appeared that were undoubtedly due to physostigma poisoning, such as tremors and exaggerated bronchial and salivary secretions. The paralysis and tremors continued for more than three hours, and the dilatation of the pupils for several days, after which the dog perfectly regained its former condition.

Experiment **53-c.**—Fifteen days after the second of these experiments, this dog, being in every respect in a normal condition, received, by subcutaneous injection, three grains of extract of physostigma—a dose equal to that from which

it recovered in the first experiment, and only one-half as large as that from which it recovered in the second. The results were, that fibrillary twitches, partial paralysis, and tremors were quickly produced; that the lachrymal, salivary, and bronchial secretions were profusely increased; that the cardiac contractions became gradually slower and slower; that defæcation and urination occurred; and that the respirations became more and more laboured and shallow, until they ceased on the occurrence of death, at seventeen minutes after the administration.

It was ascertained after death, that the weight of the dog was ten pounds and one ounce.

In the experiment that will now be described, atropia was administered five minutes after a lethal dose of sulphate of physostigmia had been injected under the skin.

Experiment **54-a.**—An active young Scotch terrier dog, weighing ten pounds and three ounces, received, by subcutaneous injection, three-fifths of a grain of sulphate of physostigmia, dissolved in 25 minims of distilled water.

Before the injection, the rate per ten seconds of the cardiac impulses was 32, and that of the respirations 4, and the size of the pupils, in a full light, was $\frac{1}{5}\frac{2}{0}$ths × $\frac{1}{5}\frac{2}{0}$ths of an inch.

In two minutes after the commencement of the administration, symptoms of discomfort were manifested, and the lips were moved and licked with the tongue, as if an unusual quantity of fluid were present in the anterior part of the mouth. In four minutes, slight tremors frequently occurred, and fibrillary twitches were present.

In five minutes, a solution containing three-tenths of a grain of sulphate of atropia in 15 minims of distilled water, was injected under the skin at the right flank. In two minutes thereafter, the tremors already noted had become more prominent and strong, the limbs were unable properly to support the body, urine was voided, saliva escaped from the mouth, and the eyeballs were unnaturally moist. The tremors and weakness quickly increased, so that, on account of the former, it became impossible to determine the rate of the cardiac and respiratory movements; while, on account of the latter, stumbles occurred, and the head began to droop, until often it touched the floor. In five minutes, the pupils were greatly dilated, but now the secretions of the salivary and lachrymal glands were diminished. In seven minutes, the dog lay quietly on the abdomen and thorax, and in thirteen minutes, it fell over on the side. An endeavour was made to count the cardiac impulses; but when the hand was placed over the heart, the tremors referred to became so greatly increased that it was impossible to distinguish the heart's impulse. It was not until thirty-eight minutes that an attempt to count the heart's contractions was successful, and then it was found that the impulse occurred at the rate of 45 in ten seconds. At the same time, the respirations had a rate of 7 in ten seconds, and

the pupils measured $\frac{17}{50}$ths × $\frac{17}{50}$ths of an inch. In forty-eight minutes, the condition of the dog had so far improved, that, after some efforts, it rose on the limbs, and then lay down in a normal crouching attitude, with the head raised. In fifty-three minutes, the dog attempted to vomit, but it was not until one hour and sixteen minutes that emesis occurred. Soon afterwards, it again got up and walked about the room, with only a little unsteadiness. In one hour and fifty-five minutes, the animal seemed to be perfectly well. The rate per ten seconds of the cardiac contractions was 47, and that of the respirations 10, and the pupils measured about $\frac{17}{50}$ths × $\frac{17}{50}$ths of an inch. During all this time, urine had been voided only once, and no fæces had been passed.

On the following day, the dog was active and in a perfectly normal general condition. The cardiac impulses occurred at the rate of 48, and the respiratory movements at that of 5, in ten seconds, while the pupils measured $\frac{16}{50}$ths × $\frac{16}{50}$ths of an inch.

It was not, however, until the sixth day that the heart's action had become reduced to the normal frequency of about 30 contractions in the ten seconds; and the pupils remained more or less dilated for other eight days, but on the fifteenth day they had returned to the condition that existed previously to the experiment.

This dog afterwards received without any atropia a dose of physostigmia only one-half as large as that from which it recovered when atropia also was given, and the following effects were produced:—

Experiment **54-b.**—Nineteen days after the performance of the previous experiment, the dog that had been used in it received, by subcutaneous injection, three-tenths of a grain of sulphate of physostigmia, dissolved in a small quantity of distilled water. In five minutes, symptoms of discomfort, slight unsteadiness of the limbs, and fibrillary twitches were observed; and soon after, struggling and stumbling movements occurred, and the flow of tears and saliva became increased. In eight minutes, decided paralysis of the posterior extremities was present. In ten minutes, the dog lay down on the abdomen, and rested the lower jaw on the floor. Series of gentle tremors succeeded each other in rapid succession, and at the end of one of them the dog fell over on the side. Saliva now escaped freely from the mouth, wet and soft fæces were passed, and the respirations became rapid, noisy, and shallow. In fifteen minutes, the respirations were very laboured and jerking, though still abnormally frequent, and the tremors had somwhat increased in severity. In a short time, however, the tremors became less severe and frequent, but at the same time the respiratory movements became laboured, somewhat shallow, and greatly obstructed by mucus accumulated in the mouth and larynx, and the cardiac impulse became infrequent and weak. In ninteen minutes, the respirations consisted merely of rarely occurring gasps, the pupils were contracted, and the sensibility of the

eyeballs had disappeared, while it was only with difficulty that now and again a cardiac impulse could be detected. The gasping respiratory efforts became gradually separated from each other by longer and longer intervals, until they altogether ceased at twenty-two minutes after the commencement of the injection of physostigmia.

After death, it was ascertained that the weight of the dog was ten pounds and four ounces.

It is shown by these experiments, that in dogs, as in rabbits, atropia exerts a powerful counteracting influence to the lethal action of physostigma. It would have been a matter of surprise had this result not been obtained, for there was no reason to anticipate that either atropia or phyostigma would act otherwise than in comformity with the general law, that every active substance influences the same histological structures in the same way in whatever animal these structures are present. No doubt the prominence and importance of the results that are produced by essentially the same action vary somewhat in different animals; but in judging of the probable existence of an antagonism between two substances, the prominence or importance of an effect resulting from any primary action is of secondary moment to the fact of the existence of the action. Accordingly, if atropia be capable of producing upon one species of animal an influence of such a nature as to antagonise in it the lethal action of physostigma, it is difficult to imagine why it should not produce the same antagonising influence in all animals of equally high development. The mere fact of there being a difference in the lethal activity of atropia in different animals, is not sufficient to lead to the supposition that it will not in them successfully counteract the lethal action of physostigma; for the same primary actions are produced, notwithstanding the differences that may exist in the lethal activity. Many circumstances of a more or less accidental nature may modify the lethal activity of poisonous substances, and among these is the manner in which the substance is administered. In the case of atropia, its lethal activity in rabbits may be enormously increased by introducing it directly into a blood-vessal.

Experiments in which Atropia was injected into a vein and Physostigma under the skin.—It seemed therefore of importance to administer atropia by injection into a vein, in order to determine whether, when so administered, it still, notwithstanding the great increase that is thus produced in its lethal activity, retains the power to counteract the lethal action of physostigma.

EXPERIMENT **55-a**.—A rabbit, weighing four pounds, was secured by means of a CZERMAK's rabbit-holder, and one of the external facial veins was exposed, and two ligatures were loosely applied to a small portion of it dissected from its connections. Two grains of extract of physostigma was then administered to the rabbit by subcutaneous injection.

Five minutes afterwards, a thirtieth of a grain of sulphate of atropia, dissolved in 10 minims of distilled water, was injected into the exposed facial vein. The previously applied ligatures were then carefully secured, and the incision closed by silk sutures. On the animal being set free, it was observed that movements were performed with difficulty. In seven minutes after the injection of atropia, the animal lay down on the abdomen and thorax, occasionally mucous sounds were heard with the respirations, and it was observed that the entire surface of the animal was affected with fibrillary twitches. In eight minutes, the pupils were dilated ($\frac{18}{50}$ths × $\frac{17}{50}$ths of an inch), the animal had assumed a normal sitting posture, and mucous sounds no longer accompanied the respirations. Indeed, with the exception of great dilatation of the pupils and fibrillary twitches, the rabbit seemed perfectly well. In seventeen minutes, however, symptoms of paralysis again appeared, and wet fæces were passed; while in twenty-three minutes, the respirations again became accompanied with mucous sounds, and the dilatation of the pupils somewhat diminished. These symptoms continued, without any improvement in the condition of the animal, for twenty-six minutes; but in forty-six minutes after the injection of atropia, the rabbit raised itself with some difficulty, and went about unsteadily. The pupils now measured $\frac{15}{50}$ths × $\frac{14}{50}$ths of an inch, the respirations were laboured and noisy, and often the rabbit went about in a very excited manner. In one hour and fifteen minutes, a large quantity of urine was voided, and pultaceous fæces were passed. It was not until three hours and ten minutes after the injection of atropia that a nearly normal condition was assumed, and at this time no symptoms were present except dilatation of the pupils, and rarely occurring mucous respiratory sounds. Ultimately the rabbit recovered perfectly, and it was afterwards subjected to the action of a lethal though smaller dose of physostigma than that from which it had thus recovered.

Experiment **55-b.**—Seven days after the performance of the last experiment, the rabbit which had been used in it received, by subcutaneous injection, one grain and seven-tenths of extract of physostigma.

Previously to the performance of the injection, it was ascertained that the weight of the rabbit was four pounds and three ounces; that the rate, per ten seconds, of the cardiac contractions was 47, and that of the respirations 29; and that the pupils measured $\frac{15}{50}$ths × $\frac{14}{50}$ths of an inch.

After the injection, symptoms of poisoning quickly manifested themselves, and in seven minutes the rabbit was suffering from well-marked general paralysis, the rate per ten seconds of the cardiac contractions was 39, and that of the respirations 28; while the pupils measured $\frac{16}{50}$ths × $\frac{15}{50}$ths of an inch. A short period occurred during which the limbs were extended, and stumbling, excited movements took place, and then the rabbit fell on the abdomen and thorax, the respirations became noisy, wet and soft fæces were passed, and tremors

succeeded each other at short intervals. In twelve minutes, the respirations were laboured, and at the rate of 15 in ten seconds, the cardiac contractions occurred 34 times in ten seconds, and the pupils measured only $\frac{10}{50}$ths × $\frac{9}{50}$ths of an inch. The respiratory embarrassment soon became much greater, and at the same time the general paralysis increased; until, in twenty-one minutes, only laboured, gasping and noisy respirations took place, the rabbit fell over on the side, the pupils contracted to $\frac{4}{50}$ths × $\frac{3}{50}$ths of an inch, and the cardiac contractions were weak, and occurred only 12 times in ten seconds. At twenty-three minutes after the administration of physostigma, the rabbit was dead.

This method of administration was followed in the next experiment likewise.

Experiment **56-a.**—Having exposed one of the external facial veins on the left side of a rabbit, weighing three pounds and two ounces, I injected under the skin, at the left flank, one grain and three-fifths of extract of physostigma, mixed with 15 minims of distilled water.

Five minutes afterwards, I injected into the exposed and dissected vein a forty-fifth of a grain of sulphate of atropia, dissolved in 8 minims of distilled water. The vein was then ligatured, the wound closed with silk sutures, and the rabbit set free from the Czermak's holder by which it had been secured.

In nine minutes after the injection of sulphate of atropia, the rabbit was lying on the abdomen and chest, frequent fibrillary twitches were occurring over the whole surface, the pupils were dilated, and the cardiac action was abnormally frequent. In twenty-three minutes, it rose and went about, though somewhat unsteadily. From this time, the general condition of the rabbit steadily improved, until, in one hour and thirty minutes, there were no symptoms present except pupillary dilatation, abnormal frequency of cardiac action, and slight fibrillary twitches. During the experiment, there had not been any obvious increase in the secretions of the salivary, bronchial, or lachrymal glands; nor did defæcation or urination take place until more than two hours and fifteen minutes after the experiment had been commenced.

Experiment **56-b.**—The rabbit that had formed the subject of the preceding experiment received, eight days afterwards, one grain and three-tenths of extract of physostigma, suspended in a few minims of distilled water. At this time the weight of the rabbit was three pounds and four ounces.

In nine minutes after the injection of the extract, the rabbit was lying on the abdomen and chest, affected with pretty severe tremors, and breathing somewhat rapidly and noisily. In fourteen minutes, the pupils were contracted, and the respirations were laboured and embarrassed by an accumulation in the mouth of mucus and saliva, while the cardiac contractions were occurring infrequently. By this time, also, a considerable quantity of soft and pultaceous

fæces had been passed. In fifteen minutes, the rabbit was lying on the side, and laboured and infrequent gasping respirations were occurring. Soon afterwards, the sensibility of the conjunctiva disappeared, the cardiac impulses became extremely weak, and it was only at long intervals that a feeble gasp occurred. Death occurred at nineteen minutes after the administration of physostigma.

It is shown by these two experiments that in rabbits atropia retains its remarkable power of counteracting the lethal action of physostigma even when its toxic activity in these animals is greatly increased.

Experiment with a Preparation of Physostigma different from that used in all the other Experiments.—As the preceding experiments were, without exception, made with extract of physostigma and sulphate of physostigmia prepared by myself, it seemed not altogether superfluous to check the results that were obtained, by making some additional experiments with a preparation for whose activity and properties I was not responsible. Accordingly, several experiments were made with an extract prepared by Dr Cook, of the well-known firm of Messrs T. and H. Smith. With this extract essentially the same results were obtained as with the preparations used in all the other experiments. It is, therefore, unnecessary to give a description of more than one experiment in which it was employed.

Experiment **57-a.**—A rabbit, weighing three pounds and eight ounces, received, by subcutaneous injection, two grains of Dr Cook's extract of physostigma, suspended in 40 minims of distilled water. One minute and a half afterwards, it received, also by subcutaneous injection, half a grain of sulphate of atropia, dissolved in 10 minims of distilled water.

In three minutes after the injection of sulphate of atropia, the pupils measured $\frac{14}{50}$ths × $\frac{14}{50}$ths of an inch, the measurement immediately before the experiment having been $\frac{10}{50}$ths × $\frac{9}{50}$ths. In seven minutes, the pupils measured $\frac{16}{50}$ths × $\frac{16}{50}$ths of an inch, the rate of the heart's contractions was considerably accelerated, fibrillary twitches were occurring, and a little restlessness was present. In thirteen minutes, this restlessness had become somewhat greater, and the animal had decided difficulty in moving about. Soon afterwards the pupils became still more dilated, and in eighteen minutes they measured $\frac{18}{50}$ths × $\frac{17}{50}$ths of an inch. In twenty-five minutes, the difficulty in moving about had become greater—even to such an extent that often the anterior extremities yielded, and the rabbit fell on the thorax. It appeared also to be in a somewhat excited state, as confused and stumbling movements were frequently made. In fifty-two minutes, the pupils measured $\frac{15}{50}$ths × $\frac{14}{50}$ths of an inch, but no obvious change had occurred in the general condition of the animal. In one hour and ten minutes, however, evidences of recovery were manifested; the rabbit went about with but little difficulty, no restless excitement was present, and frequently a perfectly normal sitting posture was assumed. Indeed, the only symptom of an

abnormal condition that was distinctly apparent consisted of frequently occurring and well-marked fibrillary twitches. From this time the condition of the animal steadily improved until perfect recovery took place.

Experiment **57-b.**—Nine days afterwards, the rabbit which formed the subject of the previous part of this experiment received, by subcutaneous injection, one grain of Dr Cook's extract of physostigma, suspended in 20 minims of distilled water. Before the injection was made, it was ascertained that the weight of the rabbit was three pounds and eight ounces and a half, and that the pupils measured $\frac{11}{50}$ths × $\frac{10}{50}$ths of an inch.

Symptoms of poisoning very quickly appeared. In six minutes, the posterior extremities were trailing, and the anterior considerably extended, and stumbling movements occurred, while well-marked fibrillary twitches were present. In eight minutes, saliva was escaping from the mouth in drops, and tremors frequently occurred. In eleven minutes, the rabbit was lying on the abdomen and chest; several fæcal pellets were passed; the pupils were contracted ($\frac{7}{50}$ths × $\frac{5}{50}$ths of an inch); and the respirations were rapid and accompanied with mucous sounds. Soon afterwards, the head subsided until the lower jaw rested on the table; the arching of the back disappeared; the pupils became still further contracted ($\frac{4}{50}$ths × $\frac{3}{50}$ths of an inch); the cardiac contractions greatly diminished in frequency and strength; and the respiratory movements assumed a gasping character. Feeble tremors then occurred, and the head was drawn backwards; after which a condition of general flaccidity set in. A few more feeble gasps occurred, and then the respirations altogether ceased, at thirteen minutes and thirty seconds after the commencement of the injection of physostigma.

In this experiment the power of atropia to counteract the lethal action of the extract of physostigma prepared by Dr Cook is displayed in a very remarkable manner.

The second portion of the experiment shows that the lethal activity of this extract is considerably greater than that of the extract prepared by myself. Nevertheless, atropia so completely and successfully antagonised the lethal action, as to prevent the occurrence of any symptom of serious import after the administration of a dose twice as large as that by which death was afterwards produced in about thirteen minutes.

Summary of the preceding Experiments.—Before passing to the second portion of this research, it may be of advantage to give a brief summary of the various facts that have been brought forward.

1. It has been shown by a statement of the result of several experiments, that the minimum lethal dose for rabbits of extract of physostigma is 1·2 grain, and that of sulphate of physostigmia 0·12 grain, for every three pounds weight of animal.

2. The influence that is exerted by atropia upon the lethal action of extract of physostigma and sulphate of physostigmia has been examined in rabbits, and a description has been given of several experiments that were performed for this purpose. The following facts have been stated among the conditions and results of these experiments :—

EXPERIMENT **41-a.**—A rabbit, weighing 2 lbs. 15½ oz., received 0·3 grain of sulphate of atropia; and, five minutes afterwards, 1·2 grain of extract of physostigma. Recovery took place.

41-b.—Ten days afterwards, the same rabbit, now weighing 3 lbs., received 1·2 grain of extract of physostigma. Death occurred in twenty-two minutes.

EXPERIMENT **42-a.**—A rabbit, weighing 3 lbs. 4 oz., received 0·17 grain of sulphate of atropia; and, five minutes afterwards, 3·9 grains of extract of physostigma. Recovery took place.

42-b.—Eight days afterwards, the same rabbit, now weighing 3 lbs. 5 oz., received 1·3 grain of extract of physostigma. Death occurred in thirty-one minutes.

EXPERIMENT **43-a.**—A rabbit, weighing 3 lbs., received 0·5 grain of sulphate of atropia; and, five minutes afterwards, 0·24 grain of sulphate of physostigmia. Recovery took place.

43-b.—Nine days afterwards, the same rabbit, now weighing 3 lbs. ½ oz., received 0·24 grain of sulphate of physostigmia. Death occurred in nine minutes and fifty seconds.

EXPERIMENT **44-b.**—A rabbit, weighing 3 lbs. 12 oz., received 0·5 grain of sulphate of atropia; and, nearly at the same time, 3 grains of extract of physostigma. Recovery took place.

44-b.—Nine days afterwards, the same rabbit, now weighing 3 lbs. 12½ oz., received 1·5 grain of extract of physostigma. Death occurred in fifty-four minutes.

EXPERIMENT **45-a.**—A rabbit, weighing 2 lbs. 8 oz., received 0·5 grain of sulphate of atropia; and, nearly at the same time, 1 grain of extract of physostigma. Recovery took place.

45-b.—Thirteen days afterwards, the same rabbit, now weighing 2 lbs. 9 oz., received 1 grain of extract of physostigma. Death occurred in eighteen minutes.

EXPERIMENT **46-a.**—A rabbit, weighing 3 lbs. 2 oz., received 2·5 grains of extract of physostigma; and, five minutes afterwards, 0·5 grain of sulphate of atropia. Recovery took place.

46-b.—Eleven days afterwards, the same rabbit, now weighing 3 lbs. 2¾ oz., received 2·5 grains of extract of physostigma. Death occurred in eleven minutes and thirty seconds.

EXPERIMENT **47-a.**—A rabbit, weighing 3 lbs. 11½ oz., received 2 grains of extract of physostigma; and, eight minutes and thirty seconds afterwards, 0·5 grain of sulphate of atropia. Recovery took place.

47-b.—Four days afterwards, the same rabbit, now weighing 3 lbs. 8 oz., received 1·5 grain of extract of physostigma. Death occurred in fifteen minutes and thirty seconds.

EXPERIMENT **48-a.**—A rabbit, weighing 2 lbs. 14 oz., received 1·5 grain of extract of physostigma; and, ten minutes and thirty seconds afterwards, 0·5 grain of sulphate of atropia. Recovery took place.

48-b.—Twelve days afterwards, the same rabbit, now weighing 3 lbs. 1 oz., received 1·2 grain of extract of physostigma. Death occurred in thirty minutes.

EXPERIMENT **49-a.**—A rabbit, weighing 3 lbs. 3 oz., received 1·5 grain of extract of physostigma; and, ten minutes and thirty seconds afterwards, 0·5 grain of sulphate of atropia. Recovery took place.

49-b.—Nine days afterwards, the same rabbit, now weighing 3 lbs. 5 oz., received 1·3 grain of extract of physostigma. Death occurred in forty-six minutes and ten seconds.

EXPERIMENT **50-a.**—A rabbit, weighing 3 lbs. 10 oz., received 0·18 grain of sulphate of physostigmia; and, fifteen minutes and ten seconds afterwards, 0·7 grain of sulphate of atropia. Recovery took place.

50-b.—Nine days afterwards, the same rabbit, now weighing 3 lbs. 10½ oz., received 0·18 grain of sulphate of physostigmia. Death occurred in sixteen minutes.

EXPERIMENT **51-a.**—A rabbit, weighing 3 lbs. 8 oz., received 0·17 grain of sulphate of physostigmia; and, twenty-nine minutes afterwards, 0·5 grain of sulphate of atropia. Recovery took place.

51-b.—Eight days afterwards, the same rabbit, now weighing 3 lbs. 5¾ oz., received 0·13 grain of sulphate of physostigmia. Death occurred in twenty-four minutes.

3. Several experiments have been described, in which the influence exerted by atropia upon the lethal action of extract of physostigma and sulphate of physostigmia was examined in dogs also. The following facts were stated among the conditions and results of these experiments:—

Experiment **52-a.**—A dog, weighing 11 lbs., received 0·15 grain of sulphate of atropia, and, five minutes afterwards, 0·9 grain of sulphate of physostigmia. Recovery took place.

52-b.—Ten days afterwards, the same dog, now weighing 11 lbs. 4 oz., received 0·3 grain of sulphate of physostigmia. Death occurred in seventeen minutes.

Experiment **53-a.**—A dog, weighing 10 lbs., received 8 grains of sulphate of atropia, and, immediately afterwards, 3 grains of extract of physostigma. Recovery took place.

53-b.—Three weeks afterwards, the same dog, now weighing 10 lbs. 2 oz., received 8 grains of sulphate of atropia, and, immediately afterwards, 6 grains of extract of physostigma. Recovery took place.

53-c.—Fifteen days after the second experiment, the same dog, now weighing 10 lbs. 1 oz., received 3 grains of extract of physostigma. Death occurred in seventeen minutes.

Experiment **54-a.**—A dog, weighing 10 lbs. 3 oz., received 0·6 grain of sulphate of physostigmia, and, five minutes afterwards, 0·3 grain of sulphate of atropia. Recovery took place.

54-b.—Nineteen days afterwards, the same dog, now weighing 10 lbs. 4 oz., received 0·3 grain of sulphate of physostigmia. Death occurred in twenty minutes.

Although these experiments clearly demonstrate that atropia is able to counteract the lethal action of physostigma in rabbits and dogs, it is possible to suppose that it will not do so in other animals of equally high development. Some support is given to this surmise by evidence tending to show that the action of atropia in certain animals is different from its action in others. The only difference, however, that is known to exist, is in the lethal activity of the substance, relatively to certain animals; and in rabbits and dogs, this lethal activity is less than in several other animals. Accordingly, if the lethal activity of atropia for rabbits and dogs be increased, and if, notwithstanding this increase, successful antagonism be still produced in them, the only reason for supposing that successful antagonism will not be produced in certain other animals will be shown to be an insufficient one. For any given species of animal, the lethal activity of atropia may be modified by the method of administration, and it is very much greater when this substance is directly introduced into the blood-stream, than when it is injected under the skin.

4. The influence exerted on the lethal action of physostigma by atropia injected directly into the blood-stream, was examined by experiments on rabbits.

The following facts were stated among the conditions and results of these experiments :—

EXPERIMENT **55-a.**—A rabbit, weighing 4 lbs., received 2 grains of extract of physostigma; and, five minutes afterwards, 0·03 grain of sulphate of atropia by injection into a facial vein. Recovery took place.

55-b.—Seven days afterwards, the same rabbit, now weighing 4 lbs. 3 oz., received 1·7 grain of extract of physostigma. Death occurred in twenty-three minutes.

EXPERIMENT **56-a.**—A rabbit, weighing 3 lbs. 2 oz., received 1·6 grain of extract of physostigma, and, five minutes afterwards, 0·02 grain of sulphate of atropia by injection into a facial vein. Recovery took place.

56-b.—Eight days afterwards, the same rabbit, now weighing 3 lbs. 4 oz., received 1·3 grain of extract of physostigma. Death occurred in nineteen minutes.

5. An experiment was described, which had been undertaken to determine whether a preparation of physostigma, different from that used in any of the other experiments of this research, has its lethal action counteracted by sulphate of atropia. The following facts were stated among the conditions and results of this experiment:—

EXPERIMENT **57-a.**—A rabbit, weighing 3 lbs. 8 oz., received 2 grains of extract of physostigma, prepared by Dr COOK; and, one minute and thirty seconds afterwards, 0·5 grain of sulphate of atropia. Recovery took place.

57-b.—Nine days afterwards, the same rabbit, now weighing 3 lbs. 8½ oz., received 1 grain of extract of physostigma, prepared by Dr COOK. Death occurred in thirteen minutes and thirty seconds.

These various experiments prove so clearly that atropia is able to counteract the lethal action of physostigma, as to be of themselves sufficient for the purposes of this section. Their evidence may, however, be largely added to from the very numerous experiments that were necessarily performed in the second portion of this research.

Section B.—DETERMINATION OF THE EXTENT OF THE COUNTERACTING INFLUENCE OF ATROPIA UPON THE LETHAL ACTION OF PHYSOSTIGMA.

In the "preliminary note" which I communicated to this Society, on the antagonism between physostigma and atropia, the opinion was expressed, that as this antagonism is "concerned with two substances, each of which possesses a number of actions, it is not unreasonable to anticipate that several of them are not mutually antagonistic," and that "above certain doses, a region may, therefore, be entered where the non-antagonised actions are present in sufficient degrees to be themselves able to produce fatal results."* Besides this consideration, there are others derived from our knowledge of the physiological action of physostigma, which render it probable that such a region exists.

Certain of the actions of the two substances are of a similar nature. When a dose not much above the minimum-lethal of the one is counteracted by a small dose of the other, the similar actions are not produced in sufficient intensity to become, even in combination, important toxic actions. When, however, a dose considerably above the minimum lethal of the one substance is given along with a large dose of the other, the similar actions may be produced in such intensity as to assume the importance of lethal actions.

Further, with regard to the counteracting actions themselves, it is to be observed that various of the facts mentioned in the record of experiments that is given in the preceding section tend to make mutual antagonism probable, not only of one but of several of the actions of physostigma and atropia; and it is legitimate to suppose, that with a given dose of physostigma, the counteraction produced by a certain amount of atropia will be more perfect in the case of one or more of the antagonistic actions than in that of others, and that with certain doses of the two substances such incompleteness of counteraction may exist as would, even without the occurrence of *non*-antagonised action, suffice for the production of death.

Guided by these considerations, I anticipated that the counteracting influence of atropia upon the lethal action of physostigma is successfully exerted only within a definite range of doses, and that this range may be determined by experimental research. The somewhat laborious task of making this determination has been undertaken because it seemed likely that results would thereby be obtained of the greatest interest and novelty, in connection not only with this special instance of counteraction, but also with the general subject of physiological antagonism and its important and direct bearing on the principles of therapeutics.

* *Loc. cit.*, p. 589.

In order to define the limits of the counteracting influence of atropia upon the lethal action of physostigma, three series of experiments were made.

The chief objects of the two first of these were to ascertain the maximum dose of physostigma that can be successfully antagonised by atropia, and the range of doses of atropia that can successfully antagonise lethal doses of physostigma. In each series, a constant interval of time was maintained between the administration of the two substances; but in the first, atropia was administered five minutes before physostigma, while in the second, physostigma was administered five minutes before atropia. These intervals of time were selected in preference to simultaneous administration because, practically, it is impossible for one experimenter to inject the two substances into different regions exactly at the same moment, and further, because it seemed probable that a difference would be found to exist in the counteracting power of atropia according as it is given before or after physostigma. In both of these series, experiments were made, in the first place, with the minimum-lethal dose of physostigma, and in combination with it, various doses of atropia were administered, ranging from one that was too small to prevent the lethal action, through a number that were able to prevent death, until a dose was found whose administration resulted in death. Similar experiments were made with a dose of physostigma one and a half times as large as the minimum-lethal, then with one twice as large as the minimum-lethal, and so on, at the same rate of progression, until a dose of physostigma was reached that was too large to be successfully antagonised by any dose of atropia.

The chief object of the third series of experiments was to ascertain within what limits of time between the administration of the two substances successful antagonism occurs. In the experiments of this series, a constant dose of physostigma was given along with various doses of atropia, and with each dose of atropia several experiments were made which differed from each other by a difference in the interval of time between the administration of the two substances. On this plan two sets of experiments were performed, in one of which atropia was given before physostigma, and in the other of which it was given after; and subsequently these two sets of experiments were connected together by a third, in which atropia, in various doses, was administered nearly simultaneously with the same dose of physostigma as was given in the two other sets of experiments.

All the experiments of this portion of the research were performed on rabbits. In the great majority of the experiments, the weight of the animal was about three pounds, but when it was below or in excess of this, the doses of the substances administered were calculated for three pounds weight of animal.

In the description that will now be given of these experiments, the doses

per three pounds weight of rabbit will alone be mentioned. For further details, and more especially for the actual doses, the weight of the animals, and the chief symptoms, I must refer to the Tabular Summary at the end of the paper.

1. Determination of the Limits of Antagonism when Atropia is administered Five Minutes before Physostigma.

In this series of experiments, physostigma was administered in the form of extract. It has already been shown that the minimum lethal dose of this preparation is 1·2 grain per three pounds weight of rabbit.

Experiments with the Minimum-Lethal Dose of Physostigma.—In accordance with the plan which has been indicated, the first experiments of the series were made to determine what doses of atropia can prevent the fatal action of the minimum-lethal dose of physostigma. In the experiments performed for this purpose,* the following results were obtained:—

Experiment **71**.†	With	0·005	grain	of sulphate of atropia,	death occurred.
Experiment **72-a.**	,,	0·009	,,	,,	recovery ,,
Experiment **73-a.**	,,	0·015	,,	,,	recovery ,,
Experiment **74-a.**	,,	0·02	,,	,,	recovery ,,
Experiment **75-a.**	,,	0·025	,,	,,	recovery ,,
Experiment **76-a.**	,,	0·031	,,	,,	recovery ,,
Experiment **77-a.**	,,	0·05	,,	,,	recovery ,,
Experiment **41-a.**‡	,,	0·3	,,	,,	recovery ,,
Experiment **78-a.**	,,	0·92	,,	,,	recovery ,,
Experiment **79-a.**	,,	2·	grains	,,	recovery ,,
Experiment **80-a.**	,,	3·	,,	,,	recovery ,,
Experiment **81-a.**	,,	4·3	,,	,,	recovery ,,
Experiment **82-a.**	,,	5·	,,	,,	recovery ,,
Experiment **83-a.**	,,	5·2	,,	,,	recovery ,,
Experiment **84.**	,,	5·3	,,	,,	death ,,
Experiment **85.**	,,	5·3	,,	,,	death ,,
Experiment **86.**	,,	5·4	,,	,,	death ,,
Experiment **87.**	,,	5·5	,,	,,	death ,,

* Tabular Summary, Series 1, Table 2.

† Except in two cases, the numbers of these experiments have reference to the arrangement that has been followed in the Tabular Summary at the end of the paper, where the leading facts connected with all the experiments belonging to this Section of the research are mentioned.

‡ A full description of the experiment has already been given in Section A. (see p. 544).

It is shown by this brief statement of the experiments with the minimum-lethal dose of physostigma, that while one two-hundredth of a grain of sulphate of atropia is a dose insufficient to prevent death, nine one-thousandths of a grain is one sufficiently large to do so; that any dose of sulphate of atropia ranging within the wide limits extending from the nine one-thousandths of a grain to five grains and one fifth is able to prevent the fatal effect of this dose of physostigma; and that if the dose of sulphate of atropia amount to five grains and three-tenths, the region of successful antagonism is left, and death occurrs.

Experiments with One and a half times the Minimum-Lethal Dose of Physostigma.—In the next place, experiments were made to determine what doses of atropia are able successfully to counteract a dose of physostigma one and a half times as large as the minimum-lethal.* The following results were obtained:—

Experiment **88.**—With	0·014	grain	of sulphate of atropia,	death	occurred.
Experiment **89.**	„ 0·015	„	„	death	„
Experiment **90-a.**	„ 0·02	„	„	recovery	„
Experiment **91.**	„ 0·02	„	„	death	„
Experiment **92-a.**	„ 0·02	„	„	recovery	„
Experiment **93-a.**	„ 0·03	„	„	recovery	„
Experiment **94-a.**	„ 0·05	„	„	recovery	„
Experiment **95-a.**	„ 0·05	„	„	recovery	„
Experiment **96-a.**	„ 1·5	„	„	recovery	„
Experiment **97-a.**	„ 2·	grains	„	recovery	„
Experiment **98-a.**	„ 2·6	„	„	recovery	„
Experiment **99-a.**	„ 3·3	„	„	recovery	„
Experiment **100-a.**	„ 4·1	„	„	recovery	„
Experiment **101.**	„ 4·3	„	„	death	„

From these experiments, it appears that while three two-hundredths of a grain of sulphate of atropia is a dose too small to prevent the occurrence of death after a dose of physostigma one and a half times as large as the minimum lethal, one-fiftieth of a grain is a dose sufficiently large to do so; that doses of sulphate of atropia ranging from one-fiftieth of a grain to four grains and one-tenth are able successfully to counteract this dose of physostigma; and that death occurs when the dose of sulphate of atropia is so large as four grains and three-tenths. In the presence of various causes of fallacy, which cannot altogether be obviated, it is not surprising that results of an exceptional character should occasionally be obtained. The occurrence of death in Experiment 91, where the dose of sulphate of atropia is one-fiftieth of a grain, may legiti-

* Tabular Summary, Series 1, Table 3.

mately be placed among these exceptional results. Several others will afterwards be noted.

Experiments with Twice the Minimum-Lethal Dose of Physostigma.—When atropia was administered five minutes before a dose of physostigma twice as large as the minimum-lethal, the following results were obtained :—*

Experiment **102.**—With	0·19	grain	of sulphate of atropia,	death	occurred.
Experiment **103.**	„ 0·02	„	„	death	„
Experiment **104.**	„ 0·02	„	„	death	„
Experiment **105.**	„ 0·021	„	„	death	„
Experiment **106-a.**	„ 0·025	„	„	recovery	„
Experiment **107.**	„ 0·03	„	„	death	„
Experiment **108-a.**	„ 0·04	„	„	recovery	„
Experiment **109-a.**	„ 0·05	„	„	recovery	„
Experiment **110-a.**	„ 0·3	„	„	recovery	„
Experiment **111-a.**	„ 1·	„	„	recovery	„
Experiment **112-a.**	„ 2·	grains	„	recovery	„
Experiment **113-a.**	„ 2·3	„	„	recovery	„
Experiment **114-a.**	„ 3·	„	„	recovery	„
Experiment **115-a.**	„ 3·2	„	„	recovery	„
Experiment **116.**	„ 3·3	„	„	death	„
Experiment **117.**	„ 3·5	„	„	death	„

One-fiftieth of a grain of sulphate of atropia is therefore too small a quantity to prevent death from following the administration of a dose of physostigma twice as large as the minimum-lethal, but one-fortieth of a grain is sufficient to do so; and doses ranging from one-fortieth of a grain to three grains and a fifth can successfully antagonise this dose of physostigma. When, however, a dose larger than three grains and a fifth is administered, death occurs. Experiment 107 is another instance of an exceptional result being produced. By referring to the description of this experiment in the Tabular Summary, it will be seen that soon after physostigma had been administered, the rabbit became excited and ran about and struggled energetically. Such movements and struggles appear greatly to favour the toxic action of physostigma ; and it has already been pointed out that when they occur, the minimum-lethal dose of physostigma is appreciably lessened.

Experiments with Two and a half times the Minimum-Lethal Dose of Physostigma.—When two and a half times the minimum-lethal dose of physostigma was administered, the following results were obtained :—†

* Tabular Summary, Series 1, Table 4.

† Ibid., Table 5.

EXPERIMENT **118.**—With	0·011	grain	of	sulphate	of atropia,	death occurred.
EXPERIMENT **119.** „	0·0187	„	„		death	„
EXPERIMENT **120.** „	0·025	„	„		death	„
EXPERIMENT **121-a.** „	0·025	„	„		recovery	„
EXPERIMENT **122-a.** „	0·027	„	„		recovery	„
EXPERIMENT **123-a.** „	0·028	„	„		recovery	„
EXPERIMENT **124-a.** „	0·034	„	„		recovery	„
EXPERIMENT **125-a.** „	0·0375	„	„		recovery	„
EXPERIMENT **126-a.** „	0·05	„	„		recovery	„
EXPERIMENT **127-a.** „	0·088	„	„		recovery	„
EXPERIMENT **128-a.** „	0·43	„	„		recovery	„
EXPERIMENT **129-a.** „	0·44	„	„		recovery	„
EXPERIMENT **130-a.** „	1·	„	„		recovery	„
EXPERIMENT **131-a.** „	1·2	„	„		recovery	„
EXPERIMENT **132-a.** „	1·25	„	„		recovery	„
EXPERIMENT **133-a.** „	1·63	„	„		recovery	„
EXPERIMENT **134-a.** „	2·	„	„		recovery	„
EXPERIMENT **135.** „	2·	„	„		death	„
EXPERIMENT **136-a.** „	2·2	„	„		recovery	„
EXPERIMENT **137.** „	2·3	„	„		death	„
EXPERIMENT **138.** „	2·6	„	„		death	„
EXPERIMENT **139.** „	2·66	„	„		death	„

The smallest dose of sulphate of atropia that can prevent the occurrence of death after the administration of two and a half times the minimum-lethal dose of physostigma is thus seen to be about one-fortieth of a grain; and it is remarkable that this is also the smallest dose that can prevent the occurrence of death after twice the minimum-lethal dose of physostigma. The experiments likewise show that doses of sulphate of atropia ranging from one-fortieth of a grain to two grains and a fifth are able to prevent the fatal action of two and a half times the minimum-lethal dose of physostigma; and that death occurs if the dose of atropia amount to two grains and three-tenths. In Experiment 135, death occurred with two grains of sulphate of atropia: but I am inclined to look upon this result as exceptional; for in the previous experiment the same dose was followed by recovery, and in the subsequent experiment the larger dose of two grains and a fifth was likewise followed by recovery. Death was probably due to some accidental peculiarity in the condition of the rabbit, by which the general vigour was depreciated.

Experiments with Three times the Minimum-Lethal Dose of Physostigma.—When atropia was administered five minutes before a dose of physostigma

three times as large as the minimum-lethal, the following results were obtained:—*

EXPERIMENT **140.**—With	0·043	grain	of	sulphate	of atropia,	death occurred.
EXPERIMENT **141.**	„ 0·05	„		„	death	„
EXPERIMENT **142-a.**	„ 0·06	„		„	recovery	„
EXPERIMENT **143-a.**	„ 0·076	„		„	recovery	„
EXPERIMENT **144-a.**	„ 0·088	„		„	recovery	„
EXPERIMENT **42-a.** †	„ 0·16	„		„	recovery	„
EXPERIMENT **145-a.**	„ 0·5	„		„	recovery	„
EXPERIMENT **146-a.**	„ 1·	„		„	recovery	„
EXPERIMENT **147-a.**	„ 1·2	„		„	recovery	„
EXPERIMENT **148.**	„ 1·3	„		„	death	„
EXPERIMENT **149.**	„ 1·4	„		„	death	„
EXPERIMENT **150.**	„ 1·9	„		„	death	„

These experiments show that while one-twentieth of a grain of sulphate of atropia is insufficient to prevent the occurrence of death after the administration of three times the minimum-lethal dose of physostigma, three-fiftieths of a grain is sufficient to do so. They likewise show that the lethal action of this dose of physostigma may be prevented by any dose of sulphate of atropia from three-fiftieths of a grain to one grain and a fifth; but that if the latter dose be exceeded, the region of successful antagonism is left and death occurs.

Experiments with Three and a half times the Minimum-Lethal Dose of Physostigma.—When the dose of physostigma was three and a half times the minimum lethal, the following results were obtained:—‡

EXPERIMENT **151.**—With	0·044	grain	of	sulphate	of atropia,	death occurred.
EXPERIMENT **152.**	„ 0·071	„		„	death	„
EXPERIMENT **153.**§	„ 0·1	„		„	recovery	„
EXPERIMENT **154-a.**	„ 0·2	„		„	recovery	„
EXPERIMENT **155.**	„ 0·3	„		„	death	„
EXPERIMENT **156.**	„ 0·5	„		„	death	„
EXPERIMENT **157.**	„ 1·	„		„	death	„

Accordingly, when the dose of physostigma is so large as three and a half times the minimum-lethal, the range of doses of atropia that can prevent death is a very limited one, extending only from one-tenth to one-fifth of a grain.

* Tabular Summary, Series 1, Table 6.

† A full description of this experiment has already been given in Section A. (see p. 546).

‡ Tabular Summary, Series 1, Table 7.

§ Five days after this experiment, the rabbit became weak and languid; from that time it gradually lost weight and condition; and on the twentieth day, it died. The usual experiment with a dose of physostigma alone could not, therefore, be made.

It has occasionally happened, especially when the subject of the experiment was a young animal, that the atropia effects were unusually slight. If the description in the Tabular Summary of Experiment 152 be compared with that of other experiments in which the same relative dose of atropia was administered, it will be observed that the action of atropia was not developed with its usual prominence, and that, consequently, the physostigma action was only feebly counteracted.

Experiments with Four times the Minimum-Lethal Dose of Physostigma.—When atropia was administered five minutes before a dose of physostigma equivalent to four times the minimum-lethal dose, the following results were obtained:—*

Experiment **158.**—With	0·1	grain	of	sulphate	of atropia,	death occurred.
Experiment **159.**	„ 0·15	„		„	death	„
Experiment **160.**	„ 0·2	„		„	death	„
Experiment **161.**	„ 0·2	„		„	death	„
Experiment **162.**	„ 0·3	„		„	death	„

It was unnecessary to proceed further with these experiments, as it had been rendered obvious by those previously made, that the lethal action of this large dose of physostigma cannot be prevented by atropia, if a dose of this substance between one-tenth and one-fifth of a grain be unable to do so.

It has, accordingly, been shown that the maximum dose of physostigma which can be rendered non-fatal by atropia administered five minutes previously is three and a half times the minimum-lethal dose. It has also been shown that the range of doses of atropia capable of preventing death after the administration of lethal doses of physostigma diminishes as the quantity of physostigma increases.

When these experiments are represented in a diagrammatic form, the results that have been obtained may be clearly and readily appreciated. A simple plan on which to construct a diagram is obviously suggested by the arrangement that has been followed in the description of the experiments. By placing symbolic representations of the results of the experiments performed with each lethal dose of physostigma in horizontal lines, and by arranging these lines so that the doses of physostigma shall succeed each other in regular sequence and at proper intervals, we may obtain a picture which graphically represents the various results that have been mentioned.

Diagram 1 (Plate XXIII.) illustrates the experiments described above, in which atropia was administered five minutes before lethal doses of physostigma. The experiments that terminated in death are represented by crosses, and those

* Tabular Summary, Series 1, Table 8.

that terminated in recovery by dots, while the position assigned to each experiment is determined by the doses of physostigma and atropia which were administered. The doses of atropia are represented by the distance, in a horizontal direction, from the perpendicular line forming the left margin of the diagram, and increase at the rate of one-tenth of a grain for every two subdivisions of the horizontal lines. The doses of physostigma increase from below upwards,—the minimum-lethal dose being represented by the red horizontal line, a dose one and a half times as large as the minimum-lethal by the black horizontal line immediately above the red line, a dose twice as large as the minimum-lethal by the second black horizontal line, and so on until a line is reached at the top of the diagram, which represents a dose of physostigma four times as large as the minimum-lethal. The curved line, *a b c*, separates the fatal experiments (crosses) from those which terminated in recovery (dots); and, accordingly, the blue space on the one side of it represents a region in which death always occurs, and the pink space on the other side a region in which recovery occurs. The doses that were given in any experiment within each of these regions are readily ascertained from the position of the experiment; the dose of physostigma being determined by the horizontal line on which the symbolic representation of the experiment is placed, and that of atropia by the exact spot in the horizontal line which is occupied by the representation.

With these explanations, the results of the experiments will be rendered apparent by a mere glance at the diagram. It may again be pointed out that the more obvious of these results are, that the maximum dose of physostigma which can be rendered non-lethal by atropia administered five minutes previously is about three and a half times the minimum-lethal dose, and that the range of the doses of atropia which are able to render non-fatal various otherwise fatal doses of physostigma, diminishes as the dose of physostigma increases. The general nature of these results is well illustrated in the diagram by the triangular form of the pink region of recovery after lethal doses of physostigma (*a b c*), of which the apex indicates the maximum antagonisable dose of physostigma, and the gradual increase in breadth from the apex to the red horizontal line, the gradual increase in the range of doses of atropia that can prevent the lethal effect of doses of physostigma diminishing from three and a half times the minimum-lethal to the minimum-lethal.

In this diagram, the pink region, and the curved line, *a b c*, have been extended below the red line representing the minimum-lethal dose of physostigma, and therefore into a space where the doses of physostigma are too small of themselves to cause death. The lateral extension of the diagram, however, is insufficient to exhibit the chief interest of this space; but it will be pointed out in the description of the next and only remaining group of experiments connected with the present series.

Experiments with half the Minimum-Lethal Dose of Physostigma.—The considerations which led me to anticipate that the counteracting influence of atropia upon the lethal action of physostigma is successfully exerted only within a definite range of doses, and that death may be produced when a lethal dose of physostigma, which is capable of being rendered non-lethal by atropia, is given in combination with a somewhat large non-lethal dose of atropia, also led me to anticipate that death may be produced by the combined administration of non-lethal doses of the two substances. Experiments were accordingly made,* in which half the minimum-lethal dose of physostigma was administered five minutes after various doses of atropia with the following results :—

Experiment **58**.—With	5·3	grains of	sulphate of	atropia,	recovery occurred.
Experiment **59**.	„ 6·16	„	„	recovery	„
Experiment **60**.	„ 6·2	„	„	recovery	„
Experiment **61**.	„ 6·3	„	„	recovery	„
Experiment **62**.	„ 6·5	„	„	recovery	„
Experiment **63**.	„ 7·	„	„	recovery	„
Experiment **64**.	„ 8·	„	„	recovery	„
Experiment **65**.	„ 8·8	„	„	recovery	„
Experiment **66**.	„ 9·	„	„	recovery	„
Experiment **67**.	„ 9·5	„	„	recovery	„
Experiment **68**.	„ 9·8	„	„	death	„
Experiment **69**.	„ 10·	„	„	death	„
Experiment **70**.	„ 10·5	„	„	death	„

It is shown by these experiments that when sulphate of atropia is administered five minutes before half the minimum-lethal dose of physostigma, death occurs if the dose of the former substance be nine grains and four-fifths, or more. This result appears a very remarkable one, when it is considered that a very decided counteraction is exerted by much smaller doses of atropia against the poisonous action of doses of physostigma greatly in excess of the minimum-lethal, and that the minimum-lethal dose of sulphate of atropia is about twenty-one grains. It, however, merely confirms a legitimate anticipation when certain of the results of the experiments with lethal doses of physostigma are borne in mind. Actions essentially the same as those that are produced in excessive amount when the administration of five grains and three-tenths of sulphate of atropia along with the minimum-lethal dose of physostigma is followed by death, also become excessive after the administration of nine grains and four-fifths of sulphate of atropia along with half the minimum-lethal dose of physostigma. The result may be simply explained by supposing some action or actions of both physostigma and atropia wherein there is no mutual counteraction.

* Tabular Summary, Series i. Table 1.

The effects that are produced by a combination of half the minimum-lethal dose of physostigma with sufficiently varied doses of atropia being thus determined, the entire regions of recovery and of death in the series of experiments in which atropia was administered five minutes before physostigma may now be considered.

This series is completely represented in Diagram 5 (Plate XXIV.), which has been constructed on the same plan as Diagram 1, from which, however, it differs in so far that the increase in the doses of atropia, represented by the distance in a horizontal direction from the perpendicular line forming the left margin of the diagram, proceeds at the rate of one-tenth of a grain for every subdivision of the horizontal lines, in place of for every two subdivisions. This modification was required to curtail the lateral extension of the diagram, so as to retain it within convenient limits.

The area covered by the diagram includes every possible dose of physostigma from the minutest fraction of the minimum-lethal dose to one four times as large as the minimum-lethal, and every possible dose of atropia below the minimum-lethal. In the previous section of this paper, a series of experiments was described which rendered it probable that the minimum-lethal dose of atropia for rabbits is about twenty-one grains for every three pounds weight of animal; and I have specially indicated the position of this dose by a red perpendicular line, which will be seen near the right margin of the diagram.

In the diagram, the region of recovery (pink) appears to be a very restricted one when contrasted with the region of death (blue); and it is almost unnecessary to point out that this relation may be greatly exaggerated by enlarging the diagram so as to include within it a portion of the almost unlimited area in which death occurs after combinations of physostigma and atropia unrepresented in the present diagram. As the region of recovery after lethal doses of physostigma occupies only that portion of the pink space which extends above the red horizontal line, the area that it occupies appears almost insignificantly small. Seeing, however, that a dose of physostigma *three and a half times* as large as the minimum-lethal is included within this region, its insignificance in relation to the entire region of death becomes of but little importance, when the interesting fact of the counteraction of so enormous a dose is realised.

The diagram very clearly displays the singular result, that death may follow the administration of physostigma and atropia in doses both below the minimum-lethal. The combinations that are able to produce this result are included within the blue space below the red horizontal line. The direction of the line separating this space from the subjacent area of recovery (pink) is much more horizontal than that of the line separating the region of death from that of recovery after lethal doses of physostigma. The change of direction

occurs somewhat abruptly at the intersection of the red horizontal line, representing the minimum-lethal dose of physostigma; and it very graphically represents some of the results to which attention has been drawn in the description of the experiments. It was shown by these experiments, that when physostigma is administered in lethal doses, the range of the doses of atropia that are able to produce successful counteraction increases by about one grain for each successive decrease by half the minimum-lethal dose in the dose of physostigma. When, however, physostigma is administered in a dose equivalent only to half the minimum-lethal, the range of doses of atropia that may be given without the occurrence of death is increased beyond the range for the minimum-lethal dose, not by one grain only, but by four grains and three-tenths. Accordingly, while in the region where the doses of physostigma are lethal, the line separating the area of death from that of recovery possesses a direction which indicates an increase of one grain of sulphate of atropia for each decrease by half the minimum-lethal dose in the quantity of physostigma, in the region where the dose of physostigma is less than lethal, it possesses a direction which indicates an increase of about four grains and a half of sulphate of atropia for each decrease by half the minimum-lethal dose in the quantity of physostigma.

II. Determination of the Limits of Antagonism when Atropia is Administered Five minutes after Physostigma.

The second series of experiments was undertaken to determine the limits of successful antagonism when atropia is administered five minutes after physostigma. In the experiments of this series, physostigma was administered in the form of sulphate of the active principle; of which preparation it has already been shown that the minimum-lethal dose is about 0·12 grain per three pounds weight of rabbit. As this dose is the one-tenth of the minimum-lethal dose of extract of physostigma, the experiments of the first series may readily be compared with those of the present.

Experiments with the Minimum-Lethal Dose of Physostigma.—When the minimum-lethal dose of sulphate of physostigmia was administered five minutes before various doses of sulphate of atropia, the results were as follows:—*

Experiment **168**.—With 0·01 grain of sulphate of atropia, death occurred.						
Experiment **169.**	„	0·015	„	„	death	„
Experiment **170-a.**	„	0·02	„	„	recovery	„
Experiment **171-a.**	„	0·05	„	„	recovery	„
Experiment **172-a.**	„	0·1	„	„	recovery	„
Experiment **173-a.**	„	0·2	„	„	recovery	„

* Tabular Summary, Series ii. Table 2.

EXPERIMENT **174-a.**—With 0·5 grain of sulphate of atropia recovery occurred.
EXPERIMENT **175-a.** „ 1· „ „ recovery „
EXPERIMENT **176-a.** „ 2· grains „ „ recovery „
EXPERIMENT **177-a.** „ 2·4 „ „ recovery „
EXPERIMENT **178-a.** „ 2·5 „ „ recovery „
EXPERIMENT **179.** „ 2·6 „ „ death „
EXPERIMENT **180.** „ 2·7 „ „ death „
EXPERIMENT **181.** „ 2·8 „ „ death „
EXPERIMENT **182.** „ 3· „ „ death „
EXPERIMENT **183.** „ 3·2 „ „ death „
EXPERIMENT **184.** „ 4· „ „ death „

Accordingly, if sulphate of atropia be administered five minutes after the minimum-lethal dose of physostigma, death occurs when the dose of sulphate of atropia is not more than three two-hundredths of a grain, recovery when the dose is from one fiftieth of a grain to two grains and a half, and death again when the dose is larger than two grains and a half. The range of the doses of atropia that can prevent the lethal effect of this quantity of physostigma is, therefore, considerably less when physostigma is administered five minutes before atropia, than when it is administered five minutes after it; and it will be observed that there is a like difference between the results in all the other corresponding groups of experiments in the two series.

Experiments with One and a half times the Minimum-Lethal Dose of Physostigma.—In the next instance, the limits of successful antagonism were determined in the case of a dose of physostigma one and a half times as large as the minimum-lethal :—*

EXPERIMENT **185.**—With 0·03 grain of sulphate of atropia, death occurred.
EXPERIMENT **186-a.** „ 0·05 „ „ recovery „
EXPERIMENT **187-a.** „ 0·1 „ „ recovery „
EXPERIMENT **188-a.** „ 0·2 „ „ recovery „
EXPERIMENT **189-a.** „ 0·3 „ „ recovery „
EXPERIMENT **190-a.** „ 0·4 „ „ recovery „
EXPERIMENT **191-a.** „ 0·5 „ „ recovery „
EXPERIMENT **192-a.** „ 0·7 „ „ recovery „
EXPERIMENT **193-a.** „ 1·2 „ „ recovery „
EXPERIMENT **194-a.** „ 1·5 „ „ recovery „
EXPERIMENT **195-a.** „ 2·0 grains „ „ recovery „
EXPERIMENT **196-a.** „ 2·1 „ „ recovery „

* Tabular Summary, Series ii. Table 3.

EXPERIMENT **197-a.**—With	2·1	grains	of sulphate of atropia,	recovery	occurred.
EXPERIMENT **198-a.** „	2·2	„	„	recovery	„
EXPERIMENT **199.** „	2·2	„	„	death	„
EXPERIMENT **200.** „	2·3	„	„	death	„
EXPERIMENT **201.** „	2·4	„	„	death	„
EXPERIMENT **202.** „	2·4	„	„	death	„
EXPERIMNNT **203.** „	2·5	„	„	death	„
EXPERIMENT **204.** „	3·0	„	„	death	„

It is shown by these experiments, that when sulphate of atropia is administered five minutes after this dose of physostigma, successful antagonism is produced by any dose of sulphate of atropia ranging from one twentieth of a grain to two grains and one tenth. In Experiment 198-*a.*, successful antagonism likewise followed the administration of two grains and one fifth of sulphate of atropia; but as this result was not obtained in the next experiment, in which the same dose was given, I have not included it within the limits of success.

Experiments with Twice the Minimum-Lethal Dose of Physostigma.—The following results were obtained when atropia was administered five minutes after a dose of physostigma twice as large as the minimum-lethal :—*

EXPERIMENT **205.**—With	0·05	grain	of sulphate of atropia,	death	occurred.
EXPERIMENT **206.** „	0·08	„	„	death	„
EXPERIMENT **207.** „	0·08	„	„	death	„
EXPERIMENT **208.** „	0·09	„	„	death	„
EXPERIMENT **209-a.** „	0·1	„	„	recovery	„
EXPERIMENT **210-a.** „	0·2	„	„	recovery	„
EXPERIMENT **211-a.** „	0·3	„	„	recovery	„
EXPERIMENT **212-a.** „	0·4	„	„	recovery	„
EXPERIMENT **213-a.** „	0·5	„	„	recovery	„
EXPERIMENT **214-a.** „	0·5	„	„	recovery	„
EXPERIMENT **215-a.** „	0·8	„	„	recovery	„
EXPERIMENT **216-a.** „	0·9	„	„	recovery	„
EXPERIMENT **217-a.** „	1·0	„	„	recovery	„
EXPERIMENT **218-a.** „	1·2	„	„	recovery	„
EXPERIMENT **219.** „	1·3	„	„	death	„
EXPERIMENT **220.** „	1·3	„	„	death	„
EXPERIMENT **221.** „	1·5	„	„	death	„
EXPERIMENT **222.** „	2·	grains „	„	death	„
EXPERIMENT **223.** „	2·5	„	„	death	„

* Tabular Summary, Series ii. Table 4.

These experiments prove that when sulphate of atropia is administered five minutes subsequently to a dose of physostigma twice as large as the minimum-lethal, nine one-hundredths of a grain of the former substance is too small a dose to prevent death; that doses ranging from one-tenth of a grain to one grain and a fifth are sufficient to do so; and that if the dose be larger than one grain and a fifth, the higher limit of success is passed, and death occurs.

Experiments with Two and a half times the Minimum-Lethal Dose of Physostigma.—The experiments of the next group were made with a dose of physostigma two and a half times as large as the minimum-lethal.* The doses of sulphate of atropia that were given with this dose of physostigma, and the results of the experiments are as follows:—

Experiment **224.**—With	0·05	grain	of	sulphate	of atropia,	death occurred.
Experiment **225.**	„ 0·08	„		„	death	„
Experiment **226-a.**	„ 0·1	„		„	recovery	„
Experiment **227-a.**	„ 0·15	„		„	recovery	„
Experiment **228-a.**	„ 0·2	„		„	recovery	„
Experiment **229-a.**	„ 0·3	„		„	recovery	„
Experiment **230-a.**	„ 0·5	„		„	recovery	„
Experiment **231-a.**	„ 0·6	„		„	recovery	„
Experiment **232-a.**	„ 0·7	„		„	recovery	„
Experiment **233-a.**	„ 0·8	„		„	recovery	„
Experiment **234.**	„ 0.8	„		„	death	„
Experiment **235.**	„ 0·9	„		„	death	„
Experiment **236.**	„ 1·	„		„	death	„
Experiment **237.**	„ 1·5	„		„	death	„

Accordingly, when two and a half times the minimum-lethal dose of physostigma was given five minutes before sulphate of atropia, the range of doses of the latter substance, capable of producing successful counteraction, extended only from one tenth to about seven tenths of a grain.

Experiments with Three times the Minimum-Lethal Dose of Physostigma.—When the dose of physostigma was three times as large as the minimum-lethal,† the following results were obtained:—

Experiment **238.**—With	0·1	grain	of	sulphate	of atropia,	death occurred.
Experiment **239.**	„ 0·15	„		„	death	„
Experiment **240-a.**	„ 0·16	„		„	recovery	„
Experiment **241.**	„ 0·2	„		„	death	„
Experiment **242.**	„ 0·25	„		„	death	„

* Tabular Summary, Series ii. Table 5.

† *Ibid.*, Table 6.

EXPERIMENT **243.**—With 0·3 grain of sulphate of atropia, death occurred.
EXPERIMENT **244.** „ 0·5 „ „ death „

Recovery, therefore, occurred in only one of the experiments in which atropia was administered five minutes after a dose of physostigma three times as large as the minimum-lethal. The administration of three twentieths and of one fifth of a grain of sulphate of atropia resulted in death, but recovery took place with the intermediate dose of four twenty-fifths of a grain.

Experiments with Three and a half times the Minimum-Lethal Dose of Physostigma.—The results of the previous experiments having made it obvious that the largest dose of physostigma that can be rendered non-lethal by atropia administered five minutes subsequently, is one three times as large as the minimum-lethal, it was evidently unnecessary to perform many experiments with a larger dose. Accordingly, only two such experiments were made, with a dose three and a half times as large as the minimum-lethal;* and the chief purposes of these experiments were to complete this portion of the series, and to ascertain the nature of the phenomena that are produced when this dose of physostigma is given five minutes before atropia.

EXPERIMENT **245.**—With 0·16 grain of sulphate of atropia, death occurred.
EXPERIMENT **246.** „ 0·2 „ „ death „

As both of these experiments terminated fatally, it was needless to continue the series by making experiments with a larger dose of physostigma.

The result of the whole series of experiments is therefore to show that when atropia is administered five minutes after physostigma, the largest quantity of the latter substance that can be rendered non-lethal by the former is three times the minimum-lethal dose, and that the range of the doses of atropia that are capable of preventing the lethal action of physostigma diminishes according as the dose of physostigma is increased.

The results of this series of experiments are illustrated in Diagram 3 (Plate XXIII.), which has been constructed on the same plan and scale as Diagram **1**, illustrating the first series of experiments, in order to facilitate a comparison with it. It will be seen that the most prominent of the differences between the two diagrams are, that the region of recovery after lethal doses of physostigma (distinguished as a pink area enclosed within the curved line *a b c*, and the segment *a c* of the red horizontal line) is smaller both in its perpendicular and in its horizontal extent, and that the curved line *a b c* is much more irregular in the diagram of the second series (Diagram 3) than in that of the first (Diagram 1).

The former of these differences very clearly illustrates the greater counter-

* Tabular Summary, Series ii. Table **7.**

acting power of atropia when it is administered five minutes before, than when it is administered five minutes after physostigma. It has been shown that in the one case, three and a half times the minimum-lethal dose can be rendered non-fatal, whereas in the other, only three times the minimum-lethal dose can be successfully counteracted; and not only does this difference exist, but the range of the doses of atropia that can prevent the lethal action of any given dose of physostigma is also greater in the former case than in the latter.

The greater irregularity of the curved line *a b c* in Diagram 3 than in Diagram 1 renders very manifest certain other of the results, which also, it is true, have already been mentioned in the description of the experiments, but which cannot be so well appreciated from a mere verbal description as from such a graphic representation as is afforded by the diagrams. It will be remembered that this line separates the experiments that terminated in death from those that terminated in recovery. For convenience of description, it may be regarded as consisting of two portions, *a b* and *b c*,—the former separating the experiments that terminated in recovery after the *smallest* successfully counteracting doses of atropia from those that terminated in death after still smaller doses of atropia, and the latter separating the experiments that terminated in recovery after the *largest* successfully counteracting doses of atropia from those that terminated in death after still larger doses of atropia. In connection with each of these portions of the line *a b c*, there are several points to which attention may be directed.

In Diagram 1, the portion *b c* is a straight line, because, when physostigma is administered five minutes after atropia, the largest doses of atropia that can produce successful counteraction differ from each other by one grain for each difference by half the minimum-lethal dose in the quantity of physostigma. In Diagram 3, however, *b c* is a curved line, because when physostigma is administered five minutes before atropia, the largest successfully counteracting doses of atropia do not diminish regularly as the doses of physostigma are regularly increased.

The greater irregularity of the curved line *a b c* in Diagram 3 than in Diagram 1 is apparent also in the portion *a b*; and it will be seen that this portion has a less perpendicular direction, as well as a less straight course, in the former than in the latter diagram.

In both diagrams, the steep rise of *a b* contrasts in a marked manner with the gradual descent of *b c*. This contrast brings into prominent relief those already mentioned results that show the smallest of the various doses of atropia capable of successfully counteracting different doses of physostigma to differ from each other much less than the largest. It has been ascertained by the first series of experiments, that when atropia is administered five minutes before physostigma, the difference between the smallest

dose of atropia capable of preventing death after the minimum-lethal dose of physostigma and the smallest capable of doing so after a dose three and a half times as large is only nine one-hundredths of a grain, whereas the difference between the largest doses is so great as five grains. When atropia is given five minutes after physostigma, the difference between the smallest dose capable of preventing death after the minimum-lethal dose of physostigma and after a dose three times as large is only thirteen one-hundredths of a grain, whereas the difference between the largest doses is so great as two grains and nine twentieths.

In order more clearly to display the differences between *a b* in the two series of experiments, I have drawn other two diagrams, in which the irregularities of this line are more distinctly shown than in Diagrams 1 and 3. This has been effected by simply diminishing the value of the subdivisions of the horizontal lines, so that each tenth of a grain of sulphate of atropia is indicated by twenty subdivisions in place of by two. By this modification, the direction of the line *a b* has been rendered less perpendicular, and at the same time its course has been more accurately defined. Diagram 2 represents the experiments of the first series, and Diagram 4 those of the second, and only so much of each series has been included as is required to exhibit the course of *a b*. It will be seen that in Diagram 4 the line *a b* is more irregular in its course than in Diagram 2, and that in Diagram 2 a number of irregularities are displayed in this line, which are not apparent in Diagram 1, where the same series of experiments is represented in a more contracted form.

It will likewise be seen from an inspection of the diagrams illustrative of these two series of experiments, that in rabbits a dose of sulphate of atropia equivalent to four twenty-fifths of a grain per three pounds weight of animal is able to prevent the fatal effect of any quantity of physostigma which can be rendered non-fatal by atropia, and that even a very slight modification of this dose suffices to curtail the extent of successful antagonism. There can be little doubt that in every species of animal some dose of atropia occupies a similarly important position, and bears a similar relation to the range of successfully counteracting doses. A result of some practical value has probably been obtained by the establishment of the fact that this dose is much nearer the minimum than the maximum in the range of the doses of atropia capable of preventing the lethal effect of physostigma.

Experiments with half the minimum-lethal dose of physostigma.—The next experiments were made in order to determine the smallest dose of atropia that in conjunction with half the minimum-lethal dose of physostigma administered five minutes before it is sufficient for the production of death.* The following results were obtained:—

* Tabular Summary, Series ii. Table 1.

EXPERIMENT **163**.—With 5· grains of sulphate of atropia, recovery occurred.
EXPERIMENT **164**. „ 7· „ „ recovery „
EXPERIMENT **165**. „ 7·5 „ „ recovery „
EXPERIMENT **166**. „ 8· „ „ death „
EXPERIMENT **167**. „ 8·16 „ „ death „

The smallest quantity of atropia that in conjunction with half the minimum-lethal dose of physostigma administered five minutes before it is sufficient for the production of death is thus shown to be about eight grains per three pounds weight of rabbit. In the analogous experiments of the first series a similar result was obtained, for although there death did not occur unless the dose of atropia was at least nine grains and four fifths, it is probable that this comparatively slight difference may be due to the physostigma having been given in that series in the form of extract. It will be remembered that the minimum-lethal dose of sulphate of physostigmia is somewhat less than one-tenth of that of extract of physostigma. For convenience of comparison, however, it has been assumed in the second series of experiments, that sulphate of physostigmia is *exactly* ten times as active as extract of physostigma.

With these experiments, the second series is completed. I have not considered it necessary to construct a diagram of the entire series, as all its special characters are displayed in the diagrams representing the experiments in which the doses of physostigma were lethal. With less than lethal doses, the results are so similar to those of the first series of experiments that the region of recovery would be of essentially the same form as that represented in Diagram 5.

III. Determination of the Influence of the interval of Time between the Administration of the two substances, upon the Dose of Atropia required to Counteract a given Dose of Physostigma.

In the two series of experiments that have already been described, the two following series of dose-limits of successful antagonism have been determined, namely, those limits where the atropia is given five minutes before, and those where it is given five minutes after the physostigma. Further, it has been shown that the limits in the one series differ somewhat from those in the other; and when this result is taken in connection with several obvious considerations, it is evident that the series of dose-limits of successful antagonism will be different for every different time-relation in the administration of the two substances. It is, however, evident that to make for each of any considerable number of other time-relations in the administration of the two substances, a complete series of experiments on the plan of the two series already described, would entail an amount of labour quite out of keeping with the value of any results

that might fairly be looked for. The most interesting of such results would be the determination for each case of given doses of the two substances compatible with the production of successful antagonism of the maximum period separating the administration of the one substance from that of the other, both when the atropia is administered before, and when it is administered after the physostigma.

In the experiments of the present series (3d), I have contented myself with determining this period in the case of one constant dose of physostigma with doses of atropia ranging from the one-hundredth of a grain to five grains. When the results derived from this series of experiments are considered along with those of the first and second series, an indication will, I believe, be obtained of the limits in the period separating the administration of the two substances within which successful antagonism may occur, even for the cases where the combination of doses of physostigma and atropia is different from any combination included in the present series.

The dose of physostigma I have selected for these experiments is one equivalent to one and a half times the minimum-lethal dose; and it was administered in the form of sulphate of the active principle, of which preparation this dose is represented by three twenty-fifths of a grain per three pounds weight of rabbit. With each dose of atropia that was given in combination with this dose of physostigma, several experiments were made, which differed from each other by a difference in the interval of time separating the administration of the two substances; this interval being in the first experiments such as to permit of successful antagonism, and being in each subsequent experiment altered until at length it became such as no longer to permit of successful antagonism. This, at least, was the general plan followed in this series, but it was somewhat departed from on several occasions, when the circumstances of the experiments prevented or rendered inconvenient its adoption. Briefly stated, the distinguishing characters of the series were that the dose of physostigma was constant, while the dose of atropia and the interval of time between the administration of the two substances varied.

In certain of the experiments atropia was administered before physostigma, and in others physostigma before atropia; and in order to connect together these two groups of experiments, a third group was undertaken in which atropia and physostigma were administered as nearly simultaneously as possible. In describing the chief results, I shall, as a matter of convenience, in the first place consider (*a*) the experiments in which the two substances were simultaneously administered; then (*b*) the experiments in which atropia was administered after physostigma; and finally (*c*), the experiments in which atropia was administered before physostigma.

(*a*) *Experiments in which Atropia and Physostigma were administered*

simultaneously.—In the experiments of this group,* the administration of the two substances was effected in exactly the same manner as in experiments 44–*a* and 45–*a*, Section A (pp. 553 and 555). Before mentioning the results that were obtained, it is proper to point out that a brief interval necessarily elapsed between the administration of the two substances. This interval, however, was only one of a few seconds, and, practically, was of little moment, especially as uniformity was obtained in all the experiments by care being taken always to inject the dose of atropia before that of physostigma. When, with this precaution, a dose of physostigma one and a half times as large as the minimum-lethal (0·12 grain of sulphate of physostigmia per three pounds weight of rabbit), was administrated nearly at the same moment with various doses of sulphate of atropia, the following results were obtained:—

Experiment **247.**—With	0·02	grain	of sulphate of atropia,		death	occurred.
Experiment **248.**	„ 0·02	„	„		death	„
Experiment **249–a.**	„ 0·05	„	„		recovery	„
Experiment **250–a.**	„ 0·5	„	„		recovery	„
Experiment **251–a.**	„ 1·	„	„		recovery	„
Experiment **252–a.**	„ 1·5	„	„		recovery	„
Experiment **253–a.**	„ 2·	grains	„	„	recovery	„
Experiment **254–a.**	„ 2·5	„	„		recovery	„
Experiment **255–a.**	„ 3·	„	„		recovery	„
Experiment **256–a.**	„ 3·3	„	„		recovery	„
Experiment **257.**	„ 3·5	„	„		death	„
Experiment **258.**	„ 4·	„	„		death	„
Experiment **259.**	„ 4·5	„	„		death	„
Experiment **260.**	„ 5·	„	„		death	„

It is shown by these experiments that when a dose of physostigma one and a half times as large as the minimum-lethal is administered simultaneously with sulphate of atropia, one fiftieth of a grain of the latter substance is a dose insufficient to prevent death, but that one twentieth of a grain is a dose sufficiently large to do so. It is likewise shown that the fatal effect of this dose of physostigma may be prevented when any dose of sulphate of atropia ranging from one twentieth of a grain to three grains and three tenths is given simultaneously with it, and that death occurs when the dose of sulphate of atropia is three grains and a half or greater than this.

(*b*) *Experiments in which Atropia was administered after Physostigma.*—A considerable amount of interest is attached to the experiments of the next group, in which the administration of physostigma preceded that of atropia.† In briefly describing these experiments, I shall, in the first place, consider the

* Tabular Summary, Series iii. Table 1. † Ibid. Table 2.

results obtained when the administration of atropia was effected five minutes after that of physostigma, then, those obtained when the administration of atropia was effected ten minutes after that of physostigma, and so on until a period is arrived at which is too prolonged to permit any dose of atropia to counteract successfully the dose of physostigma invariably administered in this series.

The range of the doses of sulphate of atropia that are able successfully to counteract one and a half times the minimum-lethal dose of sulphate of physostigmia, when the administration of the former substance was effected *five minutes* after that of the latter, has already been ascertained by experiments contained in the second series. It was shown by these experiments (p. 593) that this range extends from the one-twentieth of a grain to two grains and one tenth. Death was found to occur when the dose of sulphate of atropia was so small as three one-hundredths of a grain, and also when it was so large as two grains and three tenths. It will be observed that this range is smaller than that which is obtained when the two substances are simultaneously administered, for in the latter case it extends from the one twentieth of a grain to three grains and three tenths.

In the experiments where the sulphate of atropia was administered *ten minutes* after one and a half times the minimum-lethal dose of sulphate of physostigmia, the following results were obtained:—

Experiment **261**.—With 0·05 grain of sulphate of atropia, death occurred.					
Experiment **262**-a.	„	0·3	„	„	recovery „
Experiment **263**-a.	„	0·5	„	„	recovery „
Experiment **264**-a.	„	1·	„	„	recovery „
Experiment **265**-a.	„	1·5	„	„	recovery „
Experiment **266**-a.	„	2· grains	„	„	recovery „
Experiment **267**-a.	„	2·3	„	„	recovery „
Experiment **268**-a.	„	2·4	„	„	recovery „
Experiment **269**-a.	„	2·5	„	„	recovery „
Experiment **270**.	„	2·7	„	„	death „
Experiment **271**.	„	3·	„	„	death „

From these experiments it is seen, that when sulphate of atropia is administered ten minutes after sulphate of physostigmia, any dose of the former substance ranging from three tenths of a grain to two grains and a half, is able to prevent the fatal effect of one and a half times the minimum-lethal dose of the latter substance. The range is, again, a more limited one than that obtained by simultaneous administration. It is, however, a somewhat more extended one than that obtained where the atropia is administered five minutes after the physostigma, and the greater extension is due to the maximum successfully antagonising dose of sulphate of atropia being considerably greater when the administration

of atropia succeeds that of physostigma by ten minutes, than when it succeeds it by only five minutes. This difference is one, certainly, which I did not anticipate. My expectation was rather that the maximum successfully antagonising dose of sulphate of atropia would be greater when the interval was one of five minutes, than when it was one of ten minutes. It is difficult to account for the result that has been obtained. I cannot attribute it to any known cause of fallacy in the circumstances of the experiments; and the explanation that it is simply due to some of the causes of fallacy that are unavoidable in such a research, seems to be opposed by its being derived, not from one or two experiments only, but from seven, of which four belong to the interval of five minutes, and three to that of ten minutes. Of the experiments belonging to the former interval, death occurred in one where the dose of sulphate of atropia was 2·3 grains, in two where it was 2·4 grains, and in one where it was 2·5 grains; while of the experiments belonging to the latter interval, recovery occurred in one with each of these doses. Further, of these experiments, two differing in the interval but agreeing in the dose of sulphate of atropia (2·4 grains) were performed on the same day, on rabbits of nearly the same weight, and as far as could be judged, of equally healthy condition, and yet, as has already been stated, death occurred in the experiment with the former interval (Experiment 202), and recovery in that with the latter interval (Experiment 268–*a*).

Still, notwithstanding these various circumstances, it may be that the result is due to a mere accident. If, however, it be not so, its occurrence may possibly be explained by supposing that the non-antagonised action or actions of physostigma produce their maximum effect after a greater interval of time from the administration than is the case with atropia. If this be assumed, it is obvious that death will be most easily produced when the administration of the two substances is so timed that the two maxima of effect may coincide. These various suppositions being granted, the apparently anomalous result of a larger dose of sulphate of atropia being within the range of successful antagonism when the interval is one of ten minutes than when it is one of five minutes, may be accounted for, by assuming that certain actions produced by the two substances are not present in so great a degree of combined intensity when atropia is given ten minutes after physostigma as when it is given only five minutes after it.

Passing now to the experiments in which the interval of time was greater than ten minutes, I find that only one experiment was made in which atropia was administered *fourteen minutes* after physostigma (Experiment 272–*a*). In this experiment, the dose of sulphate of atropia was three tenths of a grain, and with it the fatal effect of one and a half times the minimum-lethal dose of physostigma was successfully antagonised.

Several experiments, however, were made in which the administration of the atropia was effected *fifteen minutes* after that of the physostigma. Their results are as follows:—

EXPERIMENT **273-a.**—With 0·3 grain of sulphate of atropia, recovery occurred.
EXPERIMENT **274-a.** „ 0·5 „ „ recovery „
EXPERIMENT **275-a.** „ 1· „ „ recovery „
EXPERIMENT **276.** „ 1·5 „ „ death „
EXPERIMENT **277.** „ 2· grains „ „ death „

With this interval, therefore, death is prevented from occurring by doses of sulphate of atropia ranging from three tenths of a grain to one grain. It will be observed that the range is a more limited one than that which was obtained when the two substances were simultaneously administered, and also when the interval was less than fifteen minutes. It is, however, very satisfactory to find, as an indication of the remarkable efficacy of the antagonising influence of atropia, that even when one and a half times the minimum-lethal dose of physostigma is allowed to exert its toxic power without any interference for so long a period as fifteen minutes, the administration of atropia is still able to prevent death. The details of the experiments are of so great interest that I regret that it is inadvisable to describe them fully,—since this could not be done without greatly increasing the already formidable dimensions of this communication. I must therefore content myself with referring to the abridged accounts contained in the Tabular Summary. In all of the experiments, the animal was at the point of death before the atropia was administered, and yet, in two or three minutes threreafter, the gravity of the symptoms lessened with the most extraordinary rapidity, not only in those experiments where perfect recovery was ultimately effected, but even in those where the final result was death. On several occasions also, an experiment that had been commenced could not be completed, because death occurred in less than fifteen minutes after the administration of physostigma, and, therefore, before the proper time had arrived for the administration of atropia.

When, indeed, the interval was greater than fifteen minutes, some difficulty was experienced in obtaining any evidence whatever of the influence that is exerted by atropia upon the toxic effect of this dose of physostigma. It was only after several attempts, that I succeeded in performing the two following experiments, in which atropia was administered *seventeen minutes* after one and a half times the minimum-lethal dose of physostigma.

EXPERIMENT **278.**—With 0·3 grain of sulphate of atropia, death occurred.
EXPERIMENT **279.** „ 0·5 „ „ death „

In both experiments, death occurred: in the one, after the administration

of three tenths of a grain of sulphate of atropia; in the other, after the administration of half a grain.

From the experiments of this group we learn that the fatal effect of one and a half times the minimum-lethal dose of physostigma can be prevented by any dose between one-twentieth of a grain and two grains and one tenth of sulphate of atropia, if it be administered within five minutes afterwards; by any dose between three tenths of a grain and two grains and one tenth of sulphate of atropia, if it be administered within ten minutes afterwards; and by any dose between three tenths of a grain and one grain of sulphate of atropia, if it be administered within fifteen minutes afterwards.

(*c*) *Experiments in which Atropia was administered before Physostigma.*— In the last group of experiments to be considered, the administration of atropia preceded that of physostigma.* I shall, in the first place, describe those experiments that were undertaken for the purpose of determining what range of doses of atropia can successfully counteract one and a half times the minimum-lethal dose of physostigma, when the former substance is given five minutes before the latter. In Series ii. of this section, this range has already been determined in the case of the extract of physostigma; but it was considered advisable also to perform with the sulphate of physostigmia a few experiments in which this interval was observed, as it has been shown that the dose of this substance adopted as the minimum-lethal is somewhat more powerful than the dose of extract of physostigma adopted as such (p. 543).

Experiments were accordingly performed, in which atropia in various doses was administered *five minutes* before one and a half times the minimum-lethal dose of sulphate of physostigmia. The doses of atropia given in each experiment, and the results obtained, were as follows:—

Experiment **280.**	—With 0·01 grain	of sulphate	of atropia,	death occurred.
Experiment **281-a.**	,, 0·02	,,	,,	recovery ,,
Experiment **282-a.**	,, 0·05	,,	,,	recovery ,,
Experiment **283-a.**	,, 3·5 grains	,,	,,	recovery ,,
Experiment **284-a.**	,, 3·7	,,	,,	recovery ,,
Experiment **285.**	,, 3·9	,,	,,	death ,,
Experiment **286.**	,, 4·0	,,	,,	death ,,
Experiment **287.**	,, 4·3	,,	,,	death ,,
Experiment **288.**	,, 4·5	,,	,,	death ,,
Experiment **289.**	,, 5·	,,	,,	death ,,

It is shown by these experiments that when sulphate of atropia is administered five minutes before one and a half times the minimum-lethal dose of sulphate of physostigmia, any dose of the former substance ranging from one fiftieth of a grain to three grains and seven tenths is able to produce success-

* Tabular Summary, Series iii. Table 3.

ful counteraction. The smallest of these doses of sulphate of atropia is exactly the same as that which can successfully counteract one and a half times the minimum-lethal dose of extract. The largest, however, is smaller by two fifths of a grain than the largest dose that can successfully counteract one and a half times the minimum-lethal dose of the extract; and this difference, as tending to show that the dose of sulphate of physostigmia adopted as the minimum-lethal is somewhat more powerful than the dose of extract adopted as such, confirms the result of the experiments by which the minimum-lethal dose of these two preparations of physostigma was determined.

In the description of the other experiments of this group, those performed with each of the doses of sulphate of atropia administered will be separately considered, commencing with the smallest dose that was given. The experiments made with each dose of sulphate of atropia will be briefly described in an order proceeding from the shortest to the longest interval of time that separated the administration of the two substances. In the account of these experiments, the interval of time, the dose of sulphate of atropia, and the result of the experiments, will alone be mentioned.

The smallest dose of sulphate of atropia that was given at various intervals before one and a half times the minimum-lethal dose of sulphate of physostigmia, was *one twentieth of a grain* (0·05 gr.); and with this dose the following experiments were performed :—

Experiment **290-a.**—With an interval of		10	minutes,	recovery	occurred.
Experiment **291-a.**	,,	15	,,	recovery	,,
Experiment **292-a.**	,,	20	,,	recovery	,,
Experiment **293.**	,,	25	,,	death	,,
Experiment **294.**	,,	30	,,	death	,,

These experiments show that the administration of one twentieth of a grain of sulphate of atropia may precede that of one and a half times the minimum-lethal dose of physostigma by an interval of twenty minutes, or less, and still successful antagonism will occur. If, however, this interval be prolonged beyond twenty minutes, as to twenty-five or thirty minutes, successful antagonism does not occur.

In the next experiments, the dose of sulphate of atropia was *half a grain* (0·5 gr.); and the intervals that elapsed between its administration and the subsequent administration of one and a half times the minimum-lethal dose of physostigma, as well as the results of the experiments, were as follows :—

Experiment **295-a.**—With an interval of		15	minutes,	recovery	occurred.
Experiment **296-a.**	,,	25	,,	recovery	,,
Experiment **297-a.**	,,	30	,,	recovery	,,

EXPERIMENT **298.**—With an interval of 35 minutes, death occurred.
EXPERIMENT **299.** „ 40 „ death „

It appears, therefore, that successful antagonism occurs when half a grain of sulphate of atropia is administered thirty minutes, or less, before one and a half times the minimum-lethal dose of physostigma but not when the interval is one of thirty-five minutes, or more.

The next dose of sulphate of atropia with which experiments of this kind were made was *one grain and a half* (1·5 gr.). The intervals of time that elapsed before the administration of physostigma and the results obtained were the following :—

EXPERIMENT **300-a.**—With an interval of 15 minutes, recovery occurred.
EXPERIMENT **301-a.** „ 30 „ recovery „
EXPERIMENT **302-a.** „ 40 „ recovery „
EXPERIMENT **303-a.** „ 60 „ recovery „
EXPERIMENT **304-a.** „ 65 „ recovery „
EXPERIMENT **305.** „ 70 „ death „
EXPERIMENT **306.** „ 80 „ death „

Accordingly, the longest interval compatible with the production of successful antagonism that may elapse after the administration of one grain and a half of sulphate of atropia, and before that of one and a half times the minimum-lethal dose of physostigma, is one of about sixty-five minutes.

I have next to describe, in a similarly abridged manner, a number of experiments in which the dose of sulphate of atropia was *three grains*.

EXPERIMENT **307-a.**—With an interval of 40 minutes, recovery occurred.
EXPERIMENT **308-a.** „ 65 „ recovery „
EXPERIMENT **309-a.** „ 90 „ recovery „
EXPERIMENT **310-a.** „ 95 „ recovery „
EXPERIMENT **311.** „ 100 „ death „
EXPERIMENT **312.** „ 105 „ death „
EXPERIMENT **313.** „ 120 „ death „

It is shown by these experiments that successful antagonism occurs when a dose of three grains of sulphate of atropia is administered ninety-five minutes (one hour and thirty-five minutes), or at any shorter period, before one and a half times the minimum-lethal dose of physostigma ; but that it does not occur when the period is prolonged to one hundred minutes, or still further.

The doses of sulphate of atropia that were given in the four sets of experiments of this group that have last been described, namely, 0·05 gr., 0·5 gr., 1·5 gr., and 3 grs., are all included within the range of the doses of this substance able to prevent the fatal effect of one and a half times the minimum-lethal dose of

sulphate of physostigmia both when the atropia is administered five minutes before the physostigma, and when the two substances are simultaneously administered. The dose with which the last-mentioned experiments were performed, namely, three grains, is, however, near the maximum limit of the range in the case of simultaneous administration, and, accordingly, not far from this limit in the case where atropia is administered five minutes before physostigma.

I have in the next place to describe two sets of experiments made respectively with one and the other of two doses of sulphate of atropia greater not only than the maximum dose that produces successful antagonism when given simultaneously with one and a half times the minimum-lethal dose of physostigma, but also than the maximum that does so when given five minutes before it.

The first of these doses of sulphate of atropia is *four grains and a half*. It was administered before physostigma at the intervals and with the results that will now be stated :—

Experiment **314**.—With an interval of	10	minutes,	death	occurred.
Experiment **315-a.** „	15	„	recovery	„
Experiment **316-a.** „	15	„	recovery	„
Experiment **317-a.** „	20	„	recovery	„

The very interesting and remarkable character of the results of these experiments becomes apparent when they are considered along with those of two experiments previously described, in which the same doses of sulphate of atropia and sulphate of physostigmia respectively were administered. In the first of these (Experiment 259), the administration of the two substances was simultaneously effected, and in the second (Experiment 288), the atropia was administered five minutes before the physostigma ; and in both cases death occurred. It has *now* been shown that when, with the same respective doses, the atropia is given ten minutes before the physostigma, the result is *still* a fatal one ; but that when the atropia is given fifteen or twenty minutes before the physostigma, recovery, and not death, occurs.

I have not made any experiments with this dose of sulphate of atropia for the purpose of determining the maximum interval of time that may, without hindering the production of successful antagonism, be allowed to intervene between its administration and the subsequent administration of one and a half times the minimum-lethal dose of sulphate of physostigmia.

Such a determination, however, was accomplished in the experiments where the dose of sulphate of atropia was *five grains*. The intervals of time separating the administration of the two substances, and the results obtained in these experiments, were as follows :—

EXPERIMENT **318.**—With an interval of	15	minutes,	death	occurred.	
EXPERIMENT **319.**	„	20	„	death	„
EXPERIMENT **320-a.**	„	25	„	recovery	„
EXPERIMENT **321-a.**	„	30	„	recovery	„
EXPERIMENT **322-a.**	„	65	„	recovery	„
EXPERIMENT **323.**	„	65	„	death	„
EXPERIMENT **324.**	„	105	„	death	„
EXPERIMENT **325-a.**	„	105	„	recovery	„
EXPERIMENT **326-a.**	„	140	„	recovery	„
EXPERIMENT **327-a.**	„	170	„	recovery	„
EXPERIMENT **328-a.**	„	175	„	recovery	„
EXPERIMENT **329.**	„	180	„	death	„
EXPERIMENT **330.**	„	185	„	death	„
EXPERIMENT **331.**	„	200	„	death	„

It appears from these experiments, that when a dose of five grains of sulphate of atropia is administered before one and a half times the minimum-lethal dose of sulphate of physostigmia, death occurs if the interval of time be one of fifteen minutes, or of twenty minutes; that recovery generally occurs if the interval be one included within the wide limits extending from twenty-five minutes to one hundred and seventy-five minutes (two hours and fifty-five minutes); and that death again occurs if the interval be one so great as a hundred and eighty minutes (three hours). In connection with these results also, it is of interest to point out that in two experiments previously described, where the same respective doses of sulphate of atropia and sulphate of physostigmia were given, death occurred both when the two substances were simultaneously administered (Experiment 260) and when the atropia was administered five minutes before the physostigma (Experiment 289).

A very interesting and suggestive chain of events is therefore presented by the experiments in which five grains of sulphate of atropia was administered in combination with one and a half times the minimum-lethal dose of sulphate of physostigmia. For it is seen that certain actions produced with sufficient intensity to cause death when the two substances are simultaneously administered, lose the power of doing so when the atropia is administered at an interval of twenty-five minutes before the physostigma; while the now unobscured counteraction of the lethal effect of this dose of physostigma, which makes this loss perceptible, persists till the interval is increased to three hours.

These various changes are no doubt caused by there being a progressive increase followed by a decrease in the intensity of certain of the actions that are produced by this dose of atropia. The progressive increase is probably influenced to some extent by the rate at which the atropia is

absorbed. The decrease may be referred to various causes, such as the elimination of the atropia, or its destruction in the tissues, or it may be due merely to a diminution in the degree of the actions produced by this substance, altogether independent of either elimination or destruction.

To whatever cause we refer the decrease in intensity of the actions of atropia, in some exceptional circumstances, connected in all probability with the condition of the animal employed in the experiment, a delay seems to occur in the rapidity with which those actions are decreased, that are accountable for the production of death when the interval by which the administration of the atropia precedes that of the physostigma is one of twenty minutes, or one of shorter duration. The occurrence of this delay is well illustrated by the fatal termination of Experiments 323 and 324; in the first of which the atropia was administered sixty-five minutes, and in the other one hundred and five minutes before the physostigma. In both experiments, the symptoms that were observed closely resemble those of the experiments in which an interval too brief for the production of successful antagonism had separated the administration of the two substances. A reference to the description of these experiments in the Tabular Summary will confirm this statement.

The various results of this, the third series of experiments, have been graphically represented in Diagram 6 (Plate XXV.). This diagram agrees with the diagrams already described in showing by distance from one and the other of two straight lines placed at right angles to one another, what amount of one and the other respectively of two variables is present in each of certain combinations of them further diagrammatically distinguished by the character of the mark indicating their diagrammatic position into fatal and non-fatal: and differs from them in substituting for one of their variables, namely, the dose of physostigma, a new variable, namely, a varying interval of time separating the administration of the one substance from that of the other; the difference depending on the fact, that while in the two previous series of experiments the dose of atropia and the dose of physostigma varied, and the interval of time separating the administration of the one substance from that of the other was constant, in the present series the dose of atropia and the interval of time separating the administration of the one substance from that of the other varied, and the dose of physostigma was constant.

The representation of the *order* in which the administration of the one substance stands to that of the other, is provided for by the arrangement that in the representation of length of interval of time by distance from the line of zero interval, that distance is taken on the upper or on the under side respectively of that horizontal line, according as the administration of the atropia precedes or follows that of the physostigma. Each of the equal subdivisions of distance from the line of zero interval, which aremarked out by the lines drawn parallel

to that line, represents five minutes ; and each of those of distance to the right from the perpendicular line forming the left margin of the diagram, which are marked out by the lines drawn parallel to that line, represents (as in Diagrams 1 and 3) a twentieth of a grain of sulphate of atropia. The constant dose of physostigma was one and a half times the minimum-lethal one.

The conditions of each experiment may, therefore, at once be apprehended from the position occupied by the representation of the experiment in the diagram : whether atropia was administered before or after physostigma is seen from the representation of the experiment being placed above or below the zero line ; what the interval of time separating the administration of the two substances was, from the distance of this representation in a perpendicular direction from the zero line of time ; and what dose of sulphate of atropia was administered, from the distance of this representation in a horizontal direction from the left margin of the diagram.

In this diagram, as in the others as yet described, the experiments that terminated in recovery (dots) have been separated from those that terminated in death (crosses) by a black line ; and the regions of recovery and death that are thereby mapped out have been coloured respectively pink and blue.

When the diagram is examined, the two points to which attention will probably be attracted first are the irregular form of the region of recovery (pink), and the much greater extent, both horizontal and perpendicular, of the portion of this region where atropia was administered before physostigma than of the portion where atropia was administered after physostigma. The existence of this difference illustrates very distinctly a general result of the experiments of this series, namely, that successful antagonism occurs with a greater range of doses of atropia and with a greater range of intervals of time between the two administrations, when atropia is given before physostigma, than when it is given after it. In the latter case, the length of the intervals of time is obviously limited by there being a limitation to the time within which this dose of physostigma itself produces death. In the former case, the intervals are not subject to a similar curtailment, seeing that the doses of atropia represented in the diagram are all considerably below the minimum-lethal dose.

In reference to the irregularity in the form of the region of recovery, the only special point to which attention need be drawn, is the existence of the curious anomaly in the portion where atropia was administered after physostigma. This anomaly brings into almost too great prominence the fact, already at some length considered, that the maximum dose of atropia that produces successful antagonism with the dose of physostigma employed in this series was found to be greater when the latter substance is administered ten minutes before the atropia than when it is administered only five minutes before it. It has already been shown that the existence of this seemingly anomalous result is

founded on the evidence of a sufficiently large number of trustworthy experiments to prevent its being regarded as certainly due to some of those unavoidable variations in the conditions of the experiments that we do not at present know how to make allowance for, although this is the explanation that is most naturally suggested.

Soon after presenting this anomaly, the line of demarcation between the two regions crosses the line representing simultaneous administration, and then continues its gradual ascent until it reaches the right margin of the diagram. In this course, there are indicated certain points of interest relating to the maximum dose of atropia that produces successful antagonism at different intervals of time. It is seen that this maximum dose is considerably smaller when atropia is administered after physostigma than when the two substances are simultaneously administered; that is also smaller, though by a less difference than in the previous instance, when the two substances are simultaneously administered, than when atropia is administered five minutes before physostigma; and finally, that it augments in size with each increase of the interval of time separating the administration of atropia from the subsequent administration of physostigma. So that, as I have already pointed out, when such a dose of sulphate of atropia as five grains is used, death occurs when it is administered at any interval after the physostigma, simultaneously with it, or at any interval less than twenty minutes before it; but, on the other hand, recovery generally occurs when it is given at any interval from twenty-five to one hundred and seventy-five minutes before it.

The portion of the line of demarcation that forms the upper boundary of the region of recovery rises gradually and at a tolerably uniform rate from where it cuts the perpendicular line indicating a twentieth of a grain of sulphate of atropia to where it reaches that indicating five grains; and as this rise implies a corresponding increase in the interval of time by which the administration of atropia preceded that of physostigma, it displays very clearly another general result of the experiments, namely, the establishment of the fact that the maximum interval of time by which the administration of atropia may compatibly with the production of successful antagonism precede that of physostigma—in other words, the length of time the antidotal influence produced by the administration of a dose of atropia lasts—gradually and with tolerable regularity increases as the dose of atropia is augmented from one-twentieth of a grain to five grains. How far increase of that interval goes on in the case of further increase of the dose of atropia, has not been tested by experiment; but it seems likely that were this done, it would be found to stop at a dose of atropia somewhere between the largest already tested (five grains) and the minimum-lethal (about twenty-one grains). Near this point, the portion of the line of demarcation forming the upper boundary of the region of recovery will reach its highest

elevation (an elevation above that represented in the diagram), and either there or somewhere further in advance, it will meet the portion of the line forming the lower boundary of this region, and in this manner the boundaries of the region of recovery would be completed.

General Characters of the Symptoms produced by different Combinations of Atropia and Physostigma.—In the account that has been given of the experiments contained in this section, I have avoided all details of the nature of the symptoms that were produced, believing that any special allusion to them would probably have distracted the attention from the primary purpose of this portion of the research. Further, the minute details of the kind that in the previous section were in many instances given were not concerned with experiments performed at any special portions of the region of recovery, nor in any instance with experiments performed in the region of death. The experiments in each of these regions may be divided into two great classes, in accordance with the symptoms which they presented. In the one class, certain of the effects of atropia were prominently developed and maintained for considerable intervals, while the effects of physostigma were but slightly, or even not at all exhibited. In the other class, several of the effects of physostigma were present in a decided form, and masked either completely or in part the effects of atropia.

In the *first* and *second* series, the former class of symptoms characterised the experiments where recovery followed the administration of a large dose of atropia, and also those where death followed the administration of an excessive dose of this substance. The latter class of symptoms were present in the experiments where recovery followed the administration of a small dose of atropia, and also in those where death followed the administration of a dose of atropia insufficient to counteract successfully the lethal effect of the dose of physostigma given in combination with it.

In the *third* series, after both substances had been administered, atropia effects were most distinctly produced in the experiments where recovery followed the administration of a large dose of sulphate of atropia simultaneously with, or five or ten minutes after the dose of physostigma there given; and also in those where recovery followed the administration of the larger of the doses of sulphate of atropia that were given before this dose of physostigma, provided the interval of time separating the administration of the two substances were not a very prolonged one. These effects were likewise prominently displayed in the experiments where death followed the administration of an excessive dose of sulphate of atropia simultaneously with, or five or ten minutes after, the physostigma; and also in those where death followed the administration of from 3·9 to 5 grains of sulphate of atropia before the physostigma at an interval of time too short to permit of successful antagonism. On the other hand, the effects of physostigma were in this series most prominently

developed in the experiments where recovery followed the administration of the smaller of the doses of sulphate of atropia that were given simultaneously with, after, and before the dose of physostigma, or of a large dose of sulphate of atropia at a long interval of time before the physostigma. These effects were also produced in a marked form when death followed the administration of the smaller of the doses of sulphate of atropia that were given simultaneously with, and five minutes after and before the dose of physostigma, and when death occurred where sulphate of atropia in somewhat large doses was given before physostigma at too prolonged an interval of time to admit of successful antagonism.

Such, in general terms, were the characters of the symptoms in different portions of the regions of recovery and death. The data for a more complete analysis of these symptoms are contained in the Tabular Summary: in this very general analysis, I have, with regard to the region of recovery, contented myself with showing that the symptoms produced when atropia successfully counteracts the lethal effect of physostigma vary greatly, according to the conditions of administration. Successful antagonism is not necessarily accompanied with any special class of symptoms. It may be attended by a greater prominence of the effects of atropia, but the same is true also of those of physostigma. And, further, it does not appear that any special action belonging to one or other substance requires to be obviously or prominently produced, in order that the antagonism shall be successful.

It is almost unnecessary to add, that the experiments in which recovery occurred differed much from each other in the severity of their symptoms. In many experiments the animal was only slightly affected, and there was no reason at any time to anticipate a fatal result; in others, however, symptoms of a very serious character were developed, and in several cases it was for a long time a matter of doubt whether the animal would recover.

Combined Representation of the Three Series of Experiments.—In the three series of experiments that have now been described, I have demonstrated the limits of antagonism between atropia and physostigma,—firstly, when atropia is administered five minutes before physostigma; secondly, when atropia is administered five minutes after physostigma; and thirdly, when atropia in various doses is administered at various intervals of time before and after one and a half times the minimum-lethal dose of physostigma.

In each series of experiments, of the three quantities (namely, dose of physostigma, dose of atropia, and interval of time between the administration of the substances) only two vary, and the results of any one series may therefore be represented by a diagram constructed on a plane. Such diagrams have been constructed, and were described when the several series of experiments were being separately considered.

A combined representation of the results of the three series, involving, as it must, three variable quantities, will be best effected by means of a model in three dimensions. Such a model may be constructed by bending wires into the shape of the plane curves separating the pink and blue regions of Diagrams 1, 3, and 6, and fixing them in the manner to be described to two boards placed at right angles to one another. The wire of Diagram 1 may be called *a*, that of Diagram 3 *b*, and that of Diagram 6 *c*, and the boards may be distinguished as A and B. Wire *a* is to be so fixed to the boards that its plane shall be at right angles to both of them, and intersect A in the position of the left-hand margin, and B in that of the lower margin of Diagram 1. Wire *b* is to be so fixed to the boards that its plane shall be parallel to, and at a distance corresponding to an interval of ten minutes from that of *a*, and intersect A in the position of the left-hand margin, and B in that of the lower margin of Diagram 3. Lastly, wire *c* is to be so attached to wires *a* and *b*, that its plane shall be parallel to, and at a distance corresponding to one and a half times the minimum-lethal dose of physostigma from B, and intersect A in the position of the left-hand margin of Diagram 6 and a plane parallel to and half way between the planes of *a* and *b*, which may be called plane C, in the position of the line of simultaneous administration.

The conditions represented by any point in the model may be found by drawing from it perpendiculars to the planes A, B and C. The perpendicular upon A represents the dose of atropia; that upon B the dose of physostigma; and that upon C the interval of time between the administration of the two doses, atropia being administered first where the point is on the one side, and physostigma first when it is on the other side of the plane C.

Diagram 7 is an orthogonal projection of such a model, in which the three variables are represented on a scale somewhat different from that of Diagrams 1, 3, and 6; but this difference does not cause any difficulty in the recognition of the corresponding parts. The continuous line *a a′* represents the boundary of the region of recovery in the experiments where atropia was administered five minutes *before* physostigma (Series 1); the continuous line *b b′* the boundary of this region where atropia was administered five minutes *after* physostigma (Series 2); and the dotted line *c a′ b′ b a d* the boundary of this region where atropia was administered in various doses and at various intervals of time before and after one and a half times the minimum-lethal dose of physostigma (Series 3). It is obvious that these lines lie upon a curved surface, on whose one side every point represents conditions leading to death, and on whose other side every point represents conditions leading to recovery. The surface, of course, cannot be fully known from the three sections of it that have been obtained by these experiments. It could be known only by greatly increasing the number of the experiments, so as to obtain a number of other curves of

perpendicular sections parallel to and on either side of $b\ b'$ and $a\ a'$, and of horizontal sections parallel to and below and above $c\ a'\ b'\ b\ a\ d$. To obtain a

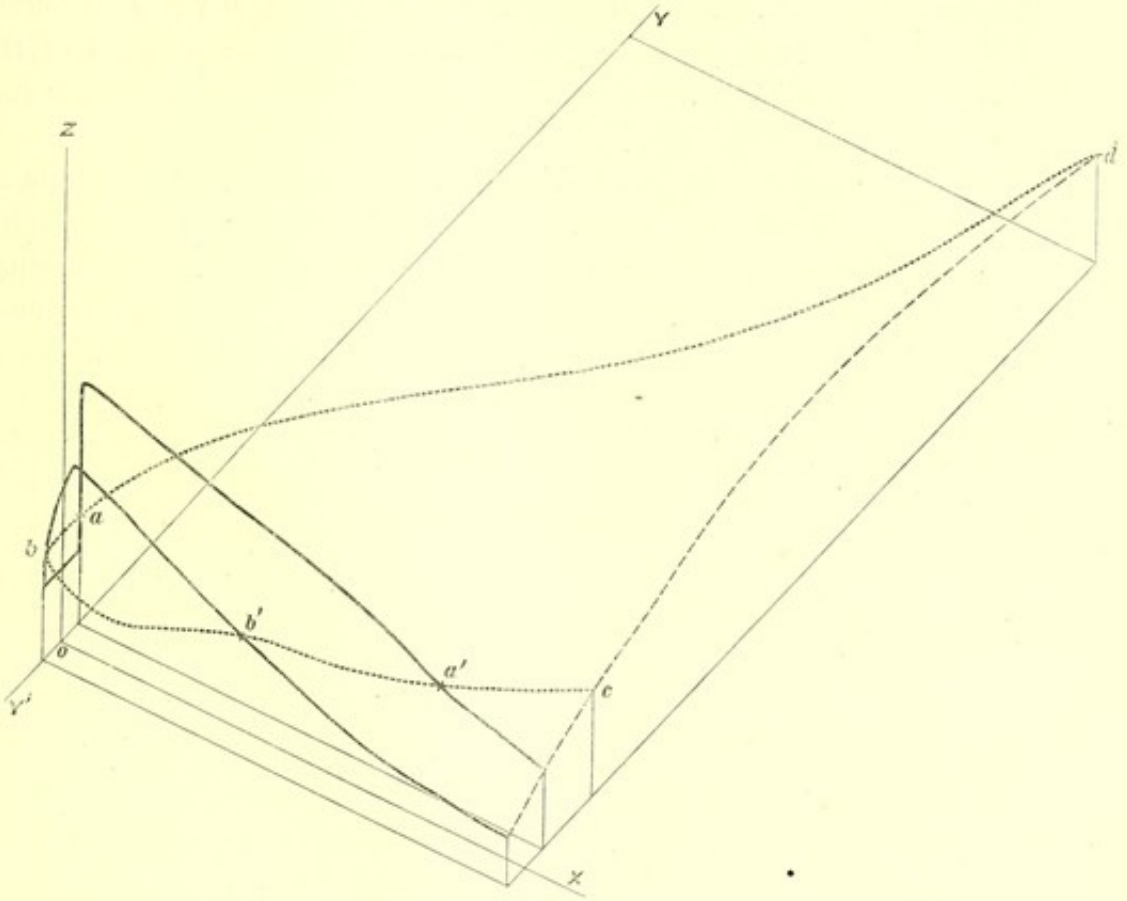


Diagram 7.

This woodcut is an orthogonal projection of a model in which the curves separating the regions of recovery and death in the three series of experiments are brought into proper relationship to each other. The curve of the first series of experiments is represented by $a\ a'$, that of the second series by $b\ b'$, and that of the third series by $c\ a'\ b'\ b\ a\ d$. Doses of physostigma are indicated by the distance (parallel to the axis of z) from the plane Y O X ; doses of atropia, by the distance (parallel to the axis of x) from the plane Z O Y ; and intervals of time between the administration of the two substances, by the distance (parallel to the axis of y) from the plane Z O X, points on the Y side of this plane indicating atropia administered *before* physostigma, and points on the Y′ side indicating atropia administered *after* physostigma. The curve $c\ a'\ b'\ b\ a\ d$ intersects the curve $a\ a'$ at a' and a, and the curve $b\ b'$ at b' and b; the points a' and a indicating the positions respectively of the largest and the smallest doses of sulphate of atropia that produce successful antagonism when administered five minutes *before* one and a-half times the minimum-lethal dose of physostigma, and the points $b'\ b$ the positions respectively of the largest and smallest doses of sulphate of atropia that produce successful antagonism when administered five minutes *after* this dose of physostigma.

In this diagram, the line $c\ a'\ b'\ b\ a\ d$ has been drawn without taking into account the apparently anomalous experiments already discussed in page 602. The interrupted line $c\ d$ occupies the supposed position of a line that would represent the results of a series of experiments in which a fixed dose of sulphate of atropia (5 grains per three pounds weight of animal), and varying doses of physostigma were administered at varying intervals of time. Such a series of experiments has not been made, but the points of intersection of this line with the lines $b\ b'$, $a\ a'$, and $c\ a'\ b'\ b\ a\ d$ are fixed by the position of the latter lines.

I am indebted to my friend Professor Crum Brown for the drawing from which this woodcut has been made, as well as for many valuable suggestions relative to the preparation of the other diagrams in this paper.

sufficient number of such curves, however, the labour and expenditure of time would be very great, seeing that so large a number of experiments as two hundred and seventy-six were made in order to obtain the curves represented in the diagram. Besides, a tolerably accurate conception of the form of the curved surface may be gained from the curves of the three series of experiments that have been made.

In all probability the summit of this curved surface does not occupy an elevation materially above that of the apex of the curve $a\ a'$; but if it reach a higher elevation, the highest point will probably be situated at only a short distance behind that apex. From the highest point the surface slopes gradually to $d\ c$, somewhat steeply to $a'\ b'$, with decided steepness to $b'\ b$, and with still greater steepness to $b\ a$.

The region included within this curved surface represents every possible variation in the doses of atropia and physostigma and in the intervals of time separating the administration of the two substances that is compatible with the production of successful antagonism between physostigma and atropia.

General Summary.—Although the above combined representation of the three series of experiments in reality presents a complete summary of the more important of the results that have been obtained, it may be convenient to briefly recapitulate these results. At page 540, I have stated that the chief objects of the research are to show that atropia possesses in a remarkable degree the power of counteracting the lethal action of physostigma, and to examine the extent of this power and define its limits.

The former object has been effected by a detailed account in Section A of several experiments in which the fatal action of a dose of physostigma equal to or greater than the minimum-lethal was prevented by the physiological action of a non-lethal dose of atropia, as well as by a brief account in Section B, of a larger number of similar experiments, which, however, are also described with greater detail in the Tabular Summary. The total number of these experiments is one hundred and sixty one; and in each of them the animal used was killed many days afterwards, and when the effects of the two substances had completely disappeared, by a dose of physostigma less than or only equal to that from which it had previously recovered.

The examination of the extent of the counteracting influence of atropia upon the lethal action of physostigma, as well as the defining of the limits of this influence have been accomplished in the manner and with the results fully described in Section B. By means of the three series of experiments contained in this section, it has been ascertained what is the maximum dose of physostigma that can be counteracted successfully by atropia, what are the doses of atropia that can counteract any given dose of physostigma, and what relation-

ship exists between the doses with which this mutual counteration occurs and the length of the interval of time by which the administration of atropia precedes or follows that of physostigma.

In presence of the many obvious proofs to the contrary contained in this paper, I have considered it superfluous to enter into any discussion of the possibility of this counteraction being the result either of some chemical reaction between atropia and physostigma, or of an increased rapidity in the elimination of the one substance produced by the action of the other. The conditions of the experiments, and the symptoms that were observed, render it certain that atropia prevents the fatal effect of a lethal dose of physostigma by so influencing the functions of certain structures, as to prevent such modifications from being produced in them by physostigma as would result in death. The one substance counteracts the action of the other; and the result is a physiological antagonism so remarkable and decided, that the fatal effect even of three and a half times the minimum-lethal dose of physostigma may be prevented by atropia. The existence of such an antagonism encourages the hope that the power of directly counteracting disease is far from unattainable, and it supplies a strong incentive to efforts designed to determine the conditions of disease and the actions of remedies with an exactitude sufficient to show how the remedial action may be applied as a counteracting influence to the diseased condition.

Explanation of Tabular Summary, &c.—In the Tabular Summary of Experiments, with which this paper ends, I have included only those experiments that are mentioned in Section B, and have endeavoured to state the leading conditions and symptoms of each experiment in as brief a manner as possible. The time of occurrence of each symptom is computed from the moment when the administration of the last-mentioned substance was commenced. It is proper to explain, that in the column of effects on secretion and excretion, the phrase "slight increase of secretion of certain buccal glands" implies merely that such an increase was inferred from certain movements of the lips suggestive of it; and that the phrase in the same column "*with atropia* none" implies merely that there was no evidence of any obvious effect; but it does not imply that diminution of secretion or excretion did not occur—for in such experiments the occurrence of this effect could not without great difficulty be certainly established. It will be observed that the size of the pupils is always indicated by two measurements: the first mentioned being the size in a perpendicular direction, and the second that in a horizontal one.

I have not considered it necessary to mention the symptoms that were observed in the *b* experiments (where a lethal dose of physostigma alone was

administered to an animal that had previously recovered from the combined administration of atropia and physostigma); for the symptoms were always very much the same, and a sufficient account of them has already been given in Section A. The *a* and *b* portions of each experiment in which they occur were performed on the same animal.

According to the system of enumeration that has been followed, the number of the experiments contained in this paper appears to be 331. This number, however, does not adequately represent the labour involved in the research, for it includes 159 experiments that consist of two parts (*a* and *b*), and one that consists of three parts (*a*, *b* and *c*); and as each of these parts is in reality a separate experiment, the total number is 492.

All these experiments were performed in the Materia Medica Laboratory of the University of Edinburgh, and I cannot sufficiently express my gratitude to Sir Robert Christison for having placed his laboratory at my disposal.

[This Paper was received for publication on Friday, November 10th, 1871. Since that time, several additions have been made to it by the Author, the most important of which is the insertion of Diagram 7 and its accompanying description.—J. H. B. *March 4th*, 1872.]

TABULAR SUMMARY OF THE EXPERIMENTS CONTAINED IN SECTION B.

SERIES I.—DETERMINATION OF THE LIMITS OF ANTAGONISM WHEN ATROPIA IS ADMINISTERED FIVE MINUTES BEFORE PHYSOSTIGMA.

TABLE 1.—Experiments with half the Minimum-Lethal Dose of Physostigma (0·6 *gr. of Extract of Physostigma per Three Pounds Weight of Rabbit*).

Number of Experiment.	Weight of Rabbit.	Doses of Sulphate of Atropia (in Grains). Actual Dose.	Doses of Sulphate of Atropia (in Grains). Dose p. 3 lbs. of Animal.	Dose of Physostigma (in Grains). Actual Dose of Extract.	Result.	Effect on the Pupils. (The measurements are in fiftieths of an inch).	Effect on the Heart.	Effect on the Respirations.	Effect on Secretion and Excretion.	Effects on Motility, &c.
58.	3 lbs.	5·3	5·3	0·6	Recovery.	*With atropia*, in 6 min., dilatation from $\frac{15}{50} \times \frac{15}{50}$ to $\frac{17}{50} \times \frac{17}{50}$. *After physostigma*, in 20 min., the dilatation had increased to $\frac{18}{50} \times \frac{18}{50}$, and it remained so for more than 2 hours.—On the following day, the size was $\frac{18}{50} \times \frac{18}{50}$; and on the 9th day, $\frac{14}{50} \times \frac{14}{50}$.	*With atropia*, in 4 min. 30 sec., acceleration from 41 to 55 per 10 sec. *After physostigma*, slight slowing occurred. In 1 hour, the rate per 10 sec. was 49; and in 1 hour 50 min., 53.—On the following day, it was 61; and on the 6th day, 42.	*With atropia*, none noted. *After physostigma*, the respirations continued to occur at about their original rapidity.	*With atropia*, none. *After physostigma*, none. Neither defæcation nor urination occurred, nor was the secretion of any buccal gland increased during the 2 hours of continuous observation.	*With atropia*, none. *After physostigma*, in 12 min., a little restlessness and excitement; and in 18 min., slight paralysis, which became rather more marked in 25 min., and then gradually lessened. No tremors occurred. Fibrillary twitches were present during the first 12 min. only, and in a very slight form.
59.	3 lbs. 2 oz.	6·43	6·16	0·62	Recovery	*With atropia*, in 2 min. 30 sec., dilatation from $\frac{13}{50} \times \frac{11}{50}$ to $\frac{15}{50} \times \frac{17}{50}$. *After physostigma*, in 8 min., the size was $\frac{15}{50} \times \frac{16}{50}$, and it continued so for 1 hour 30 min.—On the following day, the size was $\frac{15}{50} \times \frac{15}{50}$; on the 7th day, $\frac{15}{50} \times \frac{15}{50}$; on the 12th day, $\frac{14}{50} \times \frac{13}{50}$; and on the 13th day, $\frac{13}{50} \times \frac{13}{50}$.	*With atropia*, in 4 min., acceleration from 42 to 64 per 10 sec. *After physostigma*, slowing occurred, and in 1 hour 25 min., the rate per 10 sec. was 40.—On the following day, it was about 68; on the 6th day, 52; and on the 10th day, 41.	*With atropia*, none noted. *After physostigma*, the respirations continued to occur at about their original rate for at least 1 hour 30 min.	*With atropia*, none. *After physostigma*, in 1 min., urine was voided, and again in 4 min., along with several normal fæcal pellets. No increase occurred in the secretion of any buccal gland.	*With atropia*, none. *After physostigma*, in 5 min., restlessness; and in 25 min., slight paralysis, which had not increased perceptibly in 1 hour 30 min. No tremors occurred, and fibrillary twitches were present only during the first 50 min., and in a slight form.
60.	3 lbs. 3 oz.	6·58	6·2	0·63	Recovery.	*With atropia*, in 3 min., dilatation from $\frac{10}{50} \times \frac{9}{50}$ to $\frac{18}{50} \times \frac{15}{50}$. *After physostigma*, the above dilatation continued for more than 2 hours.—On the following day, the size was $\frac{18}{50} \times \frac{14}{50}$; and on the 3d day, $\frac{10}{50} \times \frac{10}{50}$.	*With atropia*, in 4 min. 30 sec., acceleration from 42 to 54 per 10 sec. *After physostigma*, the rate was maintained at about 54 per 10 sec. for 2 hours.—On the following day, it was 40 per 10 sec.	*With atropia*, none noted. *After physostigma*, slowing occurred from the original rate of 26 per 10 sec. to in 10 min. 16 per 10 sec.; and this rate was continued until 2 hours.	*With atropia*, none. *After physostigma*, none. Neither defæcation nor urination occurred, nor was the secretion of any buccal gland increased during the 2 hours of continuous observation.	*With atropia*, none. *After physostigma*, in 7 min., restlessness; in 12 min., slight weakness; and in 1 hour, distinct paralysis. Occasionally, feeble starts occurred, and only very faint fibrillary twitches were developed.

Number of Experiment.	Weight of Rabbit.	Doses of Sulphate of Atropia (in Grains).		Dose of Physostigma (in Grains). Actual Dose of Extract.	Result.	Effect on the Pupils. (The Measurements are in fiftieths of an inch.)	Effect on the Heart.	Effect on the Respirations.	Effect on Secretion and Excretion.	Effects on Motility, &c.
		Actual Dose.	Dose p. 3 lbs. of Animal.							
61.	3 lbs. 2½ oz.	6·62	6·3	0·63	Recovery.	*With atropia*, in 4 min., dilatation from $\frac{13}{50} \times \frac{11}{50}$ to $\frac{15}{50} \times \frac{15}{50}$. *After physostigma*, the above size was continued for 2 hours.—On the following day, the size was $\frac{18}{50} \times \frac{18}{50}$; on the 5th day, $\frac{16}{50} \times \frac{18}{50}$; on the 6th day, $\frac{17}{50} \times \frac{17}{50}$; and on the 12th day, $\frac{15}{50} \times \frac{15}{50}$	*With atropia*, in 4 min. 30 sec., acceleration from 41 to 50 per 10 sec. *After physostigma*, the rate per 10 sec. was in 15 min., 56; in 26 min., 48; in 1 hour 20 min., 40; and in 2 hours, 34.—On the following day, the rate per 10 sec. was 41.	*With atropia*, in 4 min. 50 sec., slowing from 19 to 12 per 10 sec. *After physostigma*, the rate per 10 sec. was in 16 min., 11; in 35 min., 14; and in 1 hour, 11.	*With atropia*, none. *After physostigma*, none. Neither defæcation nor urination occurred, nor was the secretion of any buccal gland increased during the 2 hours of continuous observation.	*With atropia*, none. *After physostigma*, in 15 min., slight paralysis, which increased a little until 1 hour, and then gradually lessened. Occasionally slight starts occurred. Fibrillary twitches were very slightly developed, and they appeared only for 12 min. after the injection of physostigma.
62.	3 lbs. 2 oz.	6·8	6·5	0·62	Recovery.	*With atropia*, in 4 min., dilatation from $\frac{13}{50} \times \frac{11}{50}$ to $\frac{15}{50} \times \frac{15}{50}$. *After physostigma*, in 8 min., further dilatation to $\frac{16}{50} \times \frac{16}{50}$; afterwards contraction occurred, and the size was in 2 hours, $\frac{14}{50} \times \frac{14}{50}$.—On the following day, the size was $\frac{16}{50} \times \frac{16}{50}$; and on the 3d day, $\frac{13}{50} \times \frac{13}{50}$.	*With atropia*, in 4 min. 30 sec., acceleration from 39 to 44 per 10 sec. *After physostigma*, the rate per 10 sec. was in 20 min., 50; in 38 min., 40; in 1 hour, 33; and in 2 hours 20 min., 41.—On the following day it was 39.	*With atropia*, none. *After physostigma*, acceleration, and then slowing was produced. The rate per 10 sec. in 2 hours 30 min. was 14.	*With atropia*, none. *After physostigma*, none.	*With atropia*, none. *After physostigma*, in 10 min., weakness; in 1 hour, distinct paralysis; and in 2 hours 30 min., only slight weakness. Occasionally slight starts occurred. Fibrillary twitches were present in the earlier portion of the experiment, but only in a slight form.
63.	3 lbs. 3 oz.	7·43	7·	0·63	Recovery.	*With atropia*, in 4 min., dilatation from $\frac{14}{50} \times \frac{13}{50}$ to $\frac{15}{50} \times \frac{15}{50}$. *After physostigma*, further dilatation to $\frac{17}{50} \times \frac{17}{50}$, and this size was maintained for more than 2 hours 40 min.	*With atropia*, in 3 min. 30 sec., acceleration from 40 to 49 per 10 sec. *After physostigma*, in 30 min., slowing had occurred to 40 per 10 sec., and this rate was maintained for more than 2 hours.—On the following day, the rate per 10 sec. was 56.	*With atropia*, none noted. *After physostigma*, the rate per 10 sec. was in 3 min., 15; in 7 min., 28; in 18 min., 25; in 30 min., 13; and in 2 hours 40 min., 11.	*With atropia*, none. *After physostigma*, none.	*With atropia*, none. *After physostigma*, in 4 min., restlessness and excitement; in 15 min., slight paralysis; in 50 min., decided paralysis; and in 2 hours 40 min., slight paralysis. No tremors or starts occurred. Fibrillary twitches were present only during the first 20 min.
64.	3 lbs. 5 oz.	8·8	8·	0·66	Recovery.	*With atropia*, in 3 min. 30 sec., dilatation from $\frac{14}{50} \times \frac{13}{50}$ to $\frac{18}{50} \times \frac{18}{50}$. *After physostigma*, the pupils remained about $\frac{19}{50} \times \frac{18}{50}$ for more than 2 hours 30 min.—On the following day, the size was $\frac{15}{50} \times \frac{13}{50}$; on the 8th day, also $\frac{13}{50} \times \frac{13}{50}$; and on the 18th day, $\frac{13}{50} \times \frac{13}{50}$.	*With atropia*, in 4 min. acceleration from 43 to 51 per 10 sec. *After physostigma*, in 35 min., slowing had occurred to 42 per 10 sec., and this rate was maintained for more than 2 hours.—On the following day, the rate per 10 sec. was 35; and on the 4th day, 45.	*With atropia*, none noted. The original rate was 35 per 10 sec. *After physostigma*, the rate per 10 sec. was in 10 min., 23; in 15 min., 34; in 50 min. 20; and in 2 hours 40 min., 16.	*With atropia*, none. *After physostigma*, in 14 min., a few normal fæcal pellets. No urination occurred, nor was the secretion of any buccal gland increased during the 2 hours and 40 min. of continuous observation.	*With atropia*, in 4 min., restlessness. *After physostigma*, the restlessness continued for several min. In 30 min. slight paralysis; and in 1 hour well marked paralysis, which had not perceptibly lessened in 2 hours 40 min. No tremors occurred, and fibrillary twitches were present only during the first 10 min., and in a very slight form.

Number of Experiment.	Weight of Rabbit.	Doses of Sulphate of Atropia (in Grains). Actual Dose.	Doses of Sulphate of Atropia (in Grains). Dose p. 3 lbs. of Animal.	Dose of Physostigma (in Grains). Actual Dose of Extract.	Result.	Effect on the Pupils. (The Measurements are in fiftieths of an inch.)	Effect on the Heart.	Effect on the Respirations.	Effect on Secretion and Excretion.	Effects on Motility, &c.
65.	3 lbs. 7 oz.	10·	8·8	0·68	Recovery.	*With atropia*, in 3 min., dilatation from $\frac{3}{50} \times \frac{3}{50}$ to $\frac{16}{50} \times \frac{16}{50}$. *After physostigma*, the pupils remained about $\frac{16}{50} \times \frac{16}{50}$ for at least 2 hours.—On the following day, the size was $\frac{8}{50} \times \frac{8}{50}$.	*With atropia*, none noted. *After physostigma*, in 2 min., acceleration occurred from the original rate of 41 to 60 per 10 sec. Afterwards slowing took place, and in 1 hour the rate per 10 sec. was 41. — On the following day, the rate per 10 sec. was 48.	*With atropia*, none. *After physostigma*, slowing from the original rate per 10 sec. of 25 occurred, but subsequently, the original rate was reassumed.	*With atropia*, in 4 min., several normal fæcal pellets were passed, and urine was voided. *After physostigma*, none.	*With atropia*, in 4 min., restlessness and some excitement. *After physostigma*, restlessness and slight excitement continued for several minutes. In 19 min., decided paralysis, which somewhat increased, and had not lessened perceptibly in 2 hours 22 min. No tremors occurred, nor were any fibrillary twitches seen.
66.	2 lbs. 15 oz.	8·98	9·	0·587	Recovery.	*With atropia*, in 3 min. 30 sec., dilatation from $\frac{10}{50} \times \frac{9}{50}$ to $\frac{16}{50} \times \frac{16}{50}$. *After physostigma*, the above dilatation remained for at least 1 hour.—On the 3d day, the size was $\frac{15}{50} \times \frac{15}{50}$; on the 6th day, $\frac{13}{50} \times \frac{13}{50}$; and on the 9th day, $\frac{11}{50} \times \frac{10}{50}$.	*With atropia*, in 4 min. 30 sec., acceleration from 38 to 58 per 10 sec. *After physostigma*, the rate per 10 sec. was in 15 min., 59; and in 45 min., about 54. — On the 3d day, it was 46; on the 6th day, 38; and on the 9th day, 41.	*With atropia*, in 4 min., slowing from 18 to 12 per 10 sec. *After physostigma*, in 20 min., the rate per 10 sec. was 13.	*With atropia*, none. *After physostigma*, in 5 min., several normal fæcal pellets were passed.	*With atropia*, none noted. *After physostigma*, restless and excited movements took place for about 25 minutes. Only a little weakness was present in 1 hour, when the observations were interrupted.
67.	3 lbs.	9·5	9·5	0·6	Recovery.	*With atropia*, in 3 min., dilatation from $\frac{11}{50} \times \frac{10}{50}$ to $\frac{16}{50} \times \frac{16}{50}$. *After physostigma*, in 12 min., the size was $\frac{14}{50} \times \frac{14}{50}$, and it remained so for at least 3 hours 48 min.—On the following day, the size was $\frac{17}{50} \times \frac{17}{50}$; on the 6th day, $\frac{12}{50} \times \frac{11}{50}$; and on the 12th day, $\frac{10}{50} \times \frac{9}{50}$.	*With atropia*, in 4 min., acceleration from 45 to at least 65 per 10 sec. *After physostigma*, in 12 min., the rate per 10 sec. was about 68; in 20 min., 56; in 30 min., 42; in 1 hour 10 min., 38; and in 1 hour 35 min., 33. The impulse was very strong at first, but in 20 min. it was weak, and after 1 hour 20 min. so weak that it could not accurately be counted. — On the following day, the impulse was strong, and the rate per 10 sec., 52; and on the 4th day, the rate per 10 sec. was 41.	*With atropia*, none. *After physostigma*, slowing occurred from the original rate per 10 sec. of 25. In 10 min. it was 15; in 30 min., 13; and in 3 hours, 10. In 2 hours 25 min. the respirations were extremely weak and shallow, and they continued so until after 3 hours 40 min.	*With atropia*, none. *After physostigma*, none. Neither defæcation nor urination occurred, nor was the secretion of any buccal gland increased during the 3 hours and 40 min. of continuous observation.	*With atropia*, restlessness, and occasionally slight starts with the respirations. *After physostigma*, restlessness continued during a few minutes. In 9 min., weakness; in 13 min., distinct though slight paralysis; and in 2 hours, well-marked paralysis and flaccidity, which were still present at 3 hours 40 min. Weak tremors and general spasms occasionally took place. Fibrillary twitches were present only during the first 20 min., and in a very slight form.

Number of Experiment.	Weight of Rabbit.	Doses of Sulphate of Atropia (in Grains). Actual Dose.	Doses of Sulphate of Atropia (in Grains). Dose p. 3 lbs. of Animal	Dose of Physostigma (in Grains). Actual Dose of Extract.	Result.	Effect on the Pupils. (The Measurements are in fiftieths of an inch.)	Effect on the Heart.	Effect on the Respirations.	Effect on Secretion and Excretion.	Effects on Motility, &c.
68.	3 lbs.	9·8	9·8	0·6	Death, in 1 hour 15 min. after the administration of physostigma.	*With atropia*, in 3 min., dilatation from $\frac{11}{50} \times \frac{10}{50}$ to $\frac{15}{50} \times \frac{15}{50}$. *After physostigma*, the size remained about $\frac{15}{50} \times \frac{15}{50}$ until death. — After death the size was in 6 min., $\frac{15}{50} \times \frac{14}{50}$; in 25 min., $\frac{14}{50} \times \frac{14}{50}$; in 1 hour, $\frac{14}{50} \times \frac{14}{50}$; and in 1 hour 20 min., $\frac{15}{50} \times \frac{15}{50}$.	*With atropia*, in 3 min. 30 sec., acceleration from 41 to 59 per 10 sec. *After physostigma*, in 15 min., the rate per 10 sec. was about 60; and in 38 min., about 42. The impulse became so weak in 35 min. that it was difficult to count the rate accurately.	*With atropia*, none noted. *After physostigma*, the rate per 10 sec. was in 6 min., 14; in 1 hour, 8; in 1 hour 5 min., 5; and afterwards irregular and feeble gasps occurred until death.	*With atropia*, none. *After physostigma*, none. Neither defæcation nor urination occurred, nor was the secretion of any gland increased.	*With atropia*, none. *After physostigma*, in 20 min., slight paralysis, and in 1 hour general flaccidity, which increased until death. Occasionally tremors and general spasms occurred. Fibrillary twitches were present during only the first 15 min.; a slight degree of stiffness was present in the limbs 25 min. after death (temp. of laboratory, 56° F.)
69.	3 lbs.	10·	10·	0·6	Death, in 2 hours 27 min. after the administration of physostigma.	*With atropia*, in 3 min., dilatation from $\frac{12}{50} \times \frac{11}{50}$ to $\frac{16}{50} \times \frac{16}{50}$. *After physostigma*, the above dilatation was continued until death. —After death the size was in 3 min., $\frac{15}{50} \times \frac{15}{50}$; and in 15 min., $\frac{15}{50} \times \frac{15}{50}$.	*With atropia*, in 4 min. 30 sec., acceleration from 44 to 52 per 10 sec. *After physostigma*, the rate per 10 sec. was in 15 min., 41; in 37 min., 39; and in 1 hour 40 min., 35. The impulse became weak in about 14 min.	*With atropia*, none noted. *After physostigma*, the rate per 10 sec. was in 12 min., 20; in 1 hour 35 min. 15; in 1 hour 50 min., 7; and soon afterwards the respirations became gasping.	*With atropia*, none. *After physostigma*, none, except that in 1 hour 50 min. a few drops of urine escaped during some spasms.	*With atropia*, none. *After physostigma*, in 37 min., decided paralysis; and in 1 hour 50 min., general flaccidity which continued until death. Occasionally tremors and general spasms occurred. No fibrillary twitches were seen.
70.	3 lbs. 2 oz.	10·9	10·5	0·63	Death, in 42 min. after the administration of physostigma.	*With atropia*, in 4 min., dilatation from $\frac{14}{50} \times \frac{13}{50}$ to $\frac{16}{50} \times \frac{15}{50}$. *After physostigma*, the size was in 4 min., $\frac{17}{50} \times \frac{16}{50}$; and in 38 min., $\frac{18}{50} \times \frac{18}{50}$.—After death, in 4 min., $\frac{13}{50} \times \frac{13}{50}$; and in 15 min., $\frac{9}{50} \times \frac{9}{50}$.	*With atropia*, in 4 min. 30 sec., acceleration from 37 to 49 per 10 sec. *After physostigma*, the rate per 10 sec. was in 3 min., 52; and in 30 min., about 49.	*With atropia*, in 4 min. 15 sec., slowing from 18 to 16 per 10 sec. *After physostigma*, the rate per 10 sec. was in 3 min., 17; in 12 min., 14; in 22 min., 9; and in 34 min., 4. Afterwards weak and irregular gasps occurred until death.	*With atropia*, none. *After physostigma*, in 6 min., a little urine was voided. No defæcation occurred, nor was the secretion of any buccal gland increased.	*With atropia*, none. *After physostigma*, restlessness and excitement were present for a few minutes. In 8 min., slight paralysis; and in 28 min., general flaccidity, which continued until death. A few tremors and feeble spasms occurred. Fibrillary twitches were present only during the earlier part of the experiment, and in an extremely slight form.

TABLE 2.—EXPERIMENTS WITH THE MINIMUM-LETHAL DOSE OF PHYSOSTIGMA (1·2 *gr. of Extract of Physostigma per Three Pounds Weight of Rabbit.*)

Number of Experiment.		Weight of Rabbit.	Doses of Sulphate of Atropia (in Grains). Actual Dose.	Doses of Sulphate of Atropia (in Grains). Dose p. 3 lbs. of Animal.	Dose of Physostigma (in Grains). Actual Dose of Extract.	Result.	Effect on the Pupils. (The Measurements are in fiftieths of an inch.)	Effect on the Heart.	Effect on the Respirations.	Effect on Secretion and Excretion.	Effects on Motility, &c.
71.		3 lbs.	0·005	0·005	1·2	Death, in 31 min. after the administration of physostigma.	*With atropia*, none. The original size was $\frac{10}{50} \times \frac{9}{50}$. *After physostigma*, the size was in 5 min., $\frac{12}{50} \times \frac{11}{50}$; in 11 min., $\frac{10}{50} \times \frac{9}{50}$; in 14 min., $\frac{7}{50} \times \frac{6}{50}$; in 19 min., $\frac{4}{50} \times \frac{3}{50}$; and in 30 min., $\frac{3}{50} \times \frac{2}{50}$. — After death, it was in 20 min., $\frac{7}{50} \times \frac{6}{50}$; and in 34 min., $\frac{10}{50} \times \frac{9}{50}$.	*With atropia*, none. The original rate was 44 per 10 sec. *After physostigma*, only decrease in the rate was observed.	*With atropia*, none. The original rate was 34 per 10 sec. *After physostigma*, the rate per 10 sec. was in 21 min., 21; and in 29 min., 13. Afterwards the respirations became gasping and very irregular.	*With atropia*, none. *After physostigma*, in 10 min., several normal fæcal pellets were passed; in 15 min., slight salivation, which afterwards became increased; and in about 15 min., increase of buccal, laryngeal and bronchial secretions, causing noisy respiration.	*With atropia*, none. *After physostigma*, in 1 min. 30 sec., infrequent fibrillary twitches, which soon became pretty well marked. In 6 min., slight feebleness; in 10 min., distinct paralysis; and in 21 min., general flaccidity. Occasionally, feeble tremors and spasms occurred.—After death, the first appearance of rigor was at about 34 min. (temp. of laboratory, 55° F.)
72.	*a*	2 lbs. 15 oz. [Experiment *b* was performed nine days after experiment *a*.]	0·01	0·009	1·175	Recovery.	*With atropia*, in 4 min. 30 sec., dilatation from $\frac{12}{50} \times \frac{11}{50}$ to $\frac{13}{50} \times \frac{13}{50}$. *After physostigma* the size was in 9 min., $\frac{15}{50} \times \frac{15}{50}$; and in 24 min., $\frac{14}{50} \times \frac{14}{50}$.—On the following day it was $\frac{11}{50} \times \frac{10}{50}$.	*With atropia*, in 4 min. 35 sec., acceleration from 38 to 40 per 10 sec. *After physostigma*, no observations were made until 1 hour 15 min., when the rate was 43 per 10 sec.—On the following day it was 40.	*With atropia*, none. The original rate was 21 per 10 sec. *After physostigma*, slight acceleration followed by slowing.	*With atropia*, none. *After physostigma*, in 24 min., pultaceous fæces were passed, and afterwards fæces of semi-liquid consistence; and in 42 min., urine was voided. In 16 min., salivation; and afterwards increase of laryngeal and bronchial secretions, causing noisy respiration, which continued for more than 1 hour 10 min.	*With atropia*, none. *After physostigma*, in 2 min., infrequent fibrillary twitches, which soon became well-marked. In 8 min., slight paralysis; in 40 min., very decided paralysis; and in 1 hour 30 min., almost no paralysis.
	b	2 lbs. 15 oz.	0	0	1·17 (= 1·2 gr. p. 3 lbs.)	Death, in 29 min.	—	—	—	—	—
73.	*a*	3 lbs. [Experiment *b* was performed eight days after experiment *a*.]	0·015	0·015	1·2	Recovery.	*With atropia*, none. *After physostigma*, in 17 min., considerable dilatation, which had disappeared by the following day.	*With atropia*, in 4 min., acceleration from 41 to 46 per 10 sec. *After physostigma*, the above increased rate had returned to the normal rate in 2 hours.	*With atropia*, none. *After physostigma*, in 20 min., slowing from 33 to 21 per 10 sec.	*With atropia*, none. *After physostigma*, in 2 hours, several normal fæcal pellets were passed. No other effect on secretion or excretion occurred.	*With atropia*, none. *After physostigma*, fibrillary twitches became very well marked and continued to end of experiment. In 10 min., decided general paralysis, which had disappeared in 2 hours 10 min. A few tremors occurred at 15 min.
	b	3 lbs.	0	0	1·2	Death, in 13 min.	—	—	—	—	—

Number of Experiment.	Weight of Rabbit.	Doses of Sulphate of Atropia (in Grains). Actual Dose.	Doses of Sulphate of Atropia (in Grains). Dose p. 3 lbs. of Animal.	Dose of Physostigma (in Grains). Actual Dose of Extract.	Result.	Effect on the Pupils. (The Measurements are in fiftieths of an inch.)	Effect on the Heart.	Effect on the Respirations.	Effect on Secretion and Excretion.	Effects on Motility, &c.
74. *a*	3 lbs. 1 oz. [Experiment *b* was performed nine days after experiment *a*.]	0·02	0·02	1·25	Recovery.	*With atropia*, in 4 min., dilatation from $\frac{11}{50} \times \frac{10}{50}$ to $\frac{14}{50} \times \frac{14}{50}$. *After physostigma*, in 8 min., further dilatation to $\frac{18}{50} \times \frac{18}{50}$; afterwards, contraction in 19 min., to $\frac{14}{50} \times \frac{15}{50}$; and in 32 min., to $\frac{11}{50} \times \frac{10}{50}$.	*With atropia*, in 4 min. 10 sec., acceleration from 39 to 41 per 10 sec. *After physostigma*, no observation was possible on account of the fibrillary twitches.—On the second day, the rate was 41 per 10 sec.	*With atropia*, none. *After physostigma*, at first, acceleration, and afterwards slowing.	*With atropia*, none. *After physostigma*, in 30 min., salivation and increase of the bronchial and buccal secretions, which became very excessive, and, though diminished, had not disappeared in 1 hour.	*With atropia*, none. *After physostigma*, fibrillary twitches became very well marked. In 15 min., decided general paralysis, which had nearly disappeared in 1 hour 10 min.
74. *b*	3 lbs. 1 oz.	0	0	1·2	Death, in 34 min.	—	—	—	—	—
75. *a*	3 lbs. [Experiment *b* was performed ten days after experiment *a*.]	0·025	0·025	1·2	Recovery.	*With atropia*, in 4 min. 20 sec., dilatation from $\frac{11}{50} \times \frac{10}{50}$ to $\frac{14}{50} \times \frac{14}{50}$. *After physostigma*, in 6 min., further dilatation to $\frac{16}{50} \times \frac{18}{50}$; and in 1 hour, contraction to $\frac{13}{50} \times \frac{11}{50}$.	*With atropia*, in 4 min., acceleration from 38 to 49 per 10 sec. *After physostigma*, in 18 min., the rate was reduced to 46 per 10 sec.; in 24 min., to 29; and in 52 min., to 27.	*With atropia*, none noted. *After physostigma*, considerable slowing.	*With atropia*, none. *After physostigma*, in 28 min., normal fæces and urine; in 1 hour 18 min., slightly pultaceous fæces, and, also, in 2 hours 15 min. No salivation, and no increase of buccal or laryngeal secretions occurred.	*With atropia*, none. *After physostigma*, fibrillary twitches soon occurred, and continued for more than 2 hours 20 min. In 10 min., slight paralysis; in 15 min., decided paralysis; and in 1 hour, only slight weakness.
75. *b*	3 lbs. 4 oz.	0	0	1·2	Death, in 29 min.	—	—	—	—	—
76. *a*	3 lbs. 1 oz. [Experiment *b* was performed eight days after experiment *a*.]	0·0312	0·031	1·25	Recovery.	*With atropia*, in 3 min., dilatation from $\frac{13}{50} \times \frac{11}{50}$ to $\frac{15}{50} \times \frac{14}{50}$. *After physostigma*, in 2 min., further dilatation to $\frac{15}{50} \times \frac{15}{50}$; then contraction, in 15 min. to $\frac{14}{50} \times \frac{13}{50}$; and in 28 min., to $\frac{13}{50} \times \frac{11}{50}$.	*With atropia*, in 4 min., acceleration from 41 to 50 per 10 sec. *After physostigma*, no observation was possible on account of the excessive fibrillary twitches.—On the following day, the rate was 45 per 10 sec.	*With atropia*, none noted. *After physostigma*, slowing, until in 1 hour the rate was 14 per 10 sec., the original rate having been 20 per 10 sec.	*With atropia*, none. *After physostigma*, in 13 min., soft fæces were passed; in 32 min., increase of laryngeal and bronchial secretions; and in 40 min., salivation.	*With atropia*, none. *After physostigma*, in 9 min., weakness; and in 17 min., decided paralysis. The paralysis had disappeared by 1 hour 40 min. Fibrillary twitches continued for more than 2 hours.
76. *b*	3 lbs. 2 oz.	0	0	1·25 (= 1·2 gr. p. 3 lbs.)	Death, in 27 min.	—	—	—	—	—
77. *a*	2 lbs. 15½ oz. [Experiment *b* was performed ten days after experiment *a*.]	0·049	0·05	1·19	Recovery.	*With atropia*, in 4 min., dilatation from $\frac{13}{50} \times \frac{13}{50}$ to $\frac{15}{50} \times \frac{15}{50}$. *After physostigma*, the pupils continued during the experiment, $\frac{15}{50} \times \frac{15}{50}$.	*With atropia*, in 4 min. 30 sec., acceleration from 40 to 45 per 10 sec. *After physostigma*, the rate was maintained at about 45 per 10 sec. as far as could be ascertained.	*With atropia*, in 3 min., acceleration from 14 to 19 per 10 sec. *After physostigma*, unimportant slowing occurred.	*With atropia*, none. *After physostigma*, in 24 min., pultaceous fæces; in 40 min., semi-liquid fæces and gelatinous matter; and in 1 hour and 40 min., pultaceous fæces and a little urine were passed. Neither salivation nor increase of the bronchial, &c., secretions occurred.	*With atropia*, none. *After physostigma*, in 8 min., weakness; and in 10 min., obvious paralysis and tremors: both of which had disappeared at 1 hour 30 min. Fibrillary twitches continued from the injection until after 2 hours.
77. *b*	3 lbs.	0	0	1·2	Death, in 20 min. 30 sec.	—	—	—	—	—

Number of Experiment.	Weight of Rabbit.	Doses of Sulphate of Atropia (in Grains). Actual Dose.	Doses of Sulphate of Atropia (in Grains). Dose p. 3 lbs. of Animal.	Dose of Physostigma (in Grains). Actual Dose of Extract.	Result.	Effect on the Pupils. (The Measurements are in fiftieths of an inch.)	Effect on the Heart.	Effect on the Respirations.	Effect on Secretion and Excretion.	Effects on Motility, &c.
41.* *a*	2 lbs. 15½ oz. [Experiment *b* was performed ten days after experiment *a*.]	0·3	0·3	1·2	Recovery.	*With atropia*, in 2 min. 30 sec., dilatation from $\frac{14}{50} \times \frac{13}{50}$ to $\frac{16}{50} \times \frac{16}{50}$. *After physostigma*, the size was in 9 min., $\frac{15}{50} \times \frac{15}{50}$; and in 1 hour 30 sec., $\frac{16}{50} \times \frac{16}{50}$.—On the following day, the size was $\frac{16}{50} \times \frac{16}{50}$; and on the 5th day, $\frac{14}{50} \times \frac{13}{50}$.	*With atropia*, in 4 min., acceleration from 40 to 54 per 10 sec. *After physostigma*, the rate per 10 sec. was in 14 min., about 46; and in 1 hour 30 min., 40.—On the following day it was 52; and on the 5th day, 41.	*With atropia*, none noted. The original rate was 12 per 10 sec. *After physostigma*, the rate per 10 sec. was in 57 min., 16.—On the following day it was 12.	*With atropia*, none. *After physostigma*, in 1 hour 3 min. and in 1 hour 16 min., pultaceous fæces were passed; in 1 hour, urine was voided; and in 1 hour 16 min., the secretion of certain buccal glands was increased.	*With atropia*, none. *After physostigma*, in 2 min., slight fibrillary twitches, which soon became well marked. In 10 min., weakness; in 26 min., decided paralysis; and in 57 min., almost no paralysis. Occasionally weak tremors and starts occurred.
b	3 lbs.	0	0	1·2	Death, in 27 min.	—	—	—	—	—
78. *a*	3 lbs. 4 oz. [Experiment *b* was performed eleven days after experiment *a*.]	1·	0·92	1·3	Recovery.	*With atropia*, in 4 min., dilatation from $\frac{12}{50} \times \frac{11}{50}$ to $\frac{16}{50} \times \frac{15}{50}$. *After physostigma*, the pupils became fully dilated, and even on the 7th day the size was $\frac{16}{50} \times \frac{16}{50}$.	*With atropia*, in 4 min. 30 sec., acceleration from 42 to 58 in 10 sec. *After physostigma*, the acceleration was somewhat increased, and then the rate remained at about 58 per 10 sec.—On the 3d day the rate was 45 per 10 sec.	*With atropia*, inconsiderable acceleration. *After physostigma*, a slightly accelerated rate was maintained.	*With atropia*, none. *After physostigma*, none.	*With atropia*, none. *After physostigma*, in 9 min., weakness, which became a little increased in 20 min., but no marked paralysis was at any time present. Fibrillary twitches were never excessive, and they were only slight during the greater part of the experiment.
b	3 lbs. 4 oz.	0	0	1·3 (= 1·2 gr. p. 3 lbs.)	Death, in 25 min.	—	—	—	—	—
79. *a*	3 lbs. 3 oz. [Experiment *b* was performed ten days after experiment *a*.]	2·1	2·	1·27	Recovery.	*With atropia*, in 3 min., dilatation from $\frac{13}{50} \times \frac{11}{50}$ to $\frac{15}{50} \times \frac{15}{50}$. *After physostigma*, in 2 min., further dilatation to $\frac{16}{50} \times \frac{16}{50}$, and this was maintained for more than 1 hour 30 min.	*With atropia*, in 4 min., acceleration from 41 to 51 per 10 sec. *After physostigma*, in a few minutes, further acceleration, and then gradual slowing until, in 50 min., the rate was 40 per 10 sec.—On the following day the rate was 36 per 10 sec.	*With atropia*, none observed. *After physostigma*, a slight slowing occurred.	*With atropia*, none. *After physostigma*, in 11 min., normal fæcal pellets were passed, and in 50 min., some more normal pellets. In 55 min., urination. There was neither salivation nor increase of the buccal, bronchial, or other secretions.	*With atropia*, none. *After physostigma*, in 17 min., fibrillary twitches were well marked and universal. In 40 min., decided weakness was present, but it soon disappeared, and no marked symptoms of paralysis were observed.
b	3 lbs.	0	0	1·2	Death, in 23 min.	—	—	—	—	—
80. *a*	3 lbs. [Experiment *b* was performed eight days after experiment *a*.]	3·	3·	1·2	Recovery.	*With atropia*, in 3 min., dilatation from $\frac{13}{50} \times \frac{12}{50}$ to $\frac{16}{50} \times \frac{16}{50}$. *After physostigma*, in 4 min., further dilatation to $\frac{18}{50} \times \frac{18}{50}$, and this was maintained for more than 2 days.	*With atropia*, in 4 min., acceleration from 42 to 60 per 10 sec. *After physostigma*, in 30 min., slowing to 52 per 10 sec., and in 1 hour 10 min., to 45 per 10 sec.—On the following day, the rate was 35 per 10 sec.	*With atropia*, acceleration. *After physostigma*, the respirations were maintained at about 17 per 10 sec.	*With atropia*, none. *After physostigma*, none.	*With atropia*, none. *After physostigma*, fibrillary twitches occurred during the whole experiment. In 22 min., slight paralysis; in 32 min., more decided, though only slight, paralysis. There was no evidence of paralysis in 1 hour 30 min.
b	3 lbs. ½ oz.	0	0	1·2	Death, in 19 min. 20 sec.	—	—	—	—	—

* A full description of this experiment has already been given in Section A (see p. 544).

Number of Experiment.	Weight of Rabbit.	Doses of Sulphate of Atropia (in Grains). Actual Dose.	Doses of Sulphate of Atropia (in Grains). Dose p. 3 lbs. of Animal.	Dose of Physostigma (in Grains). Actual Dose of Extract.	Result.	Effect on the Pupils. (The Measurements are in fiftieths of an inch.)	Effect on the Heart.	Effect on the Respirations.	Effect on Secretion and Excretion.	Effects on Motility, &c.
81. *a* [Experiment *b* was performed eleven days after experiment *a*.]	3 lbs.	4·3	4·3	1·2	Recovery.	*With atropia*, in 3 min., dilatation from $\frac{13}{50} \times \frac{11}{50}$ to $\frac{16}{50} \times \frac{15}{50}$. *After physostigma*, in 3 min., further dilatation to $\frac{18}{50} \times \frac{16}{50}$; and in 1 hour, or less, to $\frac{17}{50} \times \frac{17}{50}$. —On the following day the size was $\frac{18}{50} \times \frac{18}{50}$; on the 6th day, $\frac{18}{50} \times \frac{18}{50}$; and on the 8th day, $\frac{13}{50} \times \frac{13}{50}$.	*With atropia*, in 4 min. 30 sec., acceleration from 44 to 53 per 10 sec. *After physostigma*, in 40 min., slowing to 42 per 10 sec., which rate was present in 1 hour. —On the following day the rate was 41 per 10 sec.	*With atropia*, in 4 min., acceleration from 20 to 23 per 10 sec. *After physostigma*, an accelerated rate was maintained until 1 hour 4 min., when the rate was 17 per 10 sec.	*With atropia*, none. *After physostigma*, none.	*With atropia*, none. *After physostigma*, only very slight fibrillary twitches until 1 hour 6 min., when they became more marked. In 22 min., distinct, though slight general paralysis; but in 1 hour even this had been recovered from.
	b 3 lbs.	0	0	1·2	Death, in 38 min.	—	—	—	—	—
82. *a* [Experiment *b* was performed nine days after experiment *a*.]	3 lbs.	5·	5·	1·2	Recovery.	*With atropia*, in 4 min., dilatation from $\frac{12}{50} \times \frac{11}{50}$ to $\frac{15}{50} \times \frac{14}{50}$. *After physostigma*, in 40 min., or less, contraction to $\frac{15}{50} \times \frac{15}{50}$.—On the following day, $\frac{15}{50} \times \frac{15}{50}$; and on the 7th day, $\frac{13}{50} \times \frac{12}{50}$.	*With atropia*, in 4 min. 20 sec., acceleration from 38 to 52 per 10 sec. *After physostigma*, in 40 min., slowing to 49 per 10 sec.; and in 2 hours 25 min., to 38 per 10 sec.—On the following day, the rate was 38 per 10 sec.; on the 6th day, 48; and on the 8th day, 41.	*With atropia*, none noted. *After physostigma*, the rate was maintained nearly the same as before the experiment.	*With atropia*, none. *After physostigma*, normal fæcal pellets were several times passed, and urination occurred in 2 hours 30 min. There was neither salivation nor increase in the bronchial, &c., secretions.	*With atropia*, none. *After physostigma*, only very slight fibrillary twitches occurred, and only slight paralytic symptoms; the latter were most marked in about 20 min.
	b 2 lbs. 15 oz.	0	0	1·2	Death, in 29 min.	—	—	—	—	—
83. *a* [Experiment *b* was performed eleven days after Experiment *a*.]	3 lbs.	5·2	5·2	1·2	Recovery.	*With atropia*, in 3 min., dilatation from $\frac{14}{50} \times \frac{13}{50}$ to $\frac{14}{50} \times \frac{14}{50}$. *After physostigma*, in 2 min., further dilatation to $\frac{16}{50} \times \frac{16}{50}$, and this size maintained. — On the following day, the size was $\frac{15}{50} \times \frac{14}{50}$; and on the 8th day, $\frac{13}{50} \times \frac{12}{50}$.	*With atropia*, in 4 min., acceleration from 39 to 48 per 10 sec. *After physostigma*, no observations until the following day, when the rate was 29 per 10 sec. —On the 4th day the rate was 40 per 10 sec.	*With atropia*, none. *After physostigma*, in 32 min., slowing from original rate of 22 to 14 per 10 sec.—On the following day the rate was 12 per 10 sec.; and on the 3d day, 19 per 10 sec.	*With atropia*, none. *After physostigma*, none. No salivation, defæcation, urination, &c., during the 1 hour and 30 min. of continuous observation.	*With atropia*, none. *After physostigma*, in 15 min., slight paralysis; in 32 min., decided paralysis; and in 37 min., paralysis, along with spasmodic movements, which continued for about 30 min., after which the spasms disappeared, and the paralysis abated. Only slight fibrillary twitches occurred, but none were present after the first 40 min.
	b 3 lbs.	0	0	1·2	Death, in 21 min.	—	—	—	—	—

Number of Experiment.	Weight of Rabbit.	Doses of Sulphate of Atropia (in Grains). Actual Dose.	Doses of Sulphate of Atropia (in Grains). Dose p. 3 lbs. of Animal.	Dose of Physostigma (in Grains). Actual Dose of Extract.	Result.	Effect on the Pupils. (The Measurements are in fiftieths of an inch.)	Effect on the Heart.	Effect on the Respirations.	Effect on Secretion and Excretion.	Effects on Motility, &c.
84.	3 lbs.	5·3	5·3	1·2	Death, in 59 min. after the administration of physostigma.	*With atropia*, in 3 min., dilatation from $\frac{12}{50} \times \frac{11}{50}$ to $\frac{15}{50} \times \frac{13}{50}$. *After physostigma*, in 2 min., further dilatation to $\frac{16}{50} \times \frac{15}{50}$, which continued until death.—In 2 min. after death, the size was $\frac{14}{50} \times \frac{14}{50}$; and in 16 min., $\frac{8}{50} \times \frac{7}{50}$.	*With atropia*, in 4 min., acceleration from 42 to 51 per 10 sec. *After physostigma*, no observations were made because of the serious character of the general symptoms.	*With atropia*, in 3 min. 30 sec., slowing from 21 to 19 per 10 sec. *After physostigma*, further slowing in 21 min. to 13; in 42 min. to 12; and in 45 min. to 11. Their character was now feeble and shallow, and they gradually became more so, until death.	*With atropia*, none. *After physostigma*, none. No salivation, defæcation, nor urination at any time.	*With atropia*, none. *After physostigma*, in 10 min., slight paralysis; in 13 min., decided paralysis; and in 43 min., flaccidity, accompanied with weak spasms and tremors, and which continued until death. There were only slight fibrillary twitches, which occurred soon after the injection of physostigma.
85.	2 lbs. 15½ oz.	5·28	5·3	1·18	Death, in 1 hour 11 min. after the administration of physostigma.	*With atropia*, in 3 min., dilatation from $\frac{13}{50} \times \frac{11}{50}$ to $\frac{15}{50} \times \frac{15}{50}$. *After physostigma*, in 3 min., further dilatation to $\frac{18}{50} \times \frac{16}{50}$; in 1 hour 3 min., contraction to $\frac{15}{50} \times \frac{15}{50}$, which remained till death.—After death, in 5 min., $\frac{14}{50} \times \frac{14}{50}$; in 10 min., $\frac{13}{50} \times \frac{13}{50}$; and in 16 min., $\frac{13}{50} \times \frac{13}{50}$.	*With atropia*, in 4 min. 30 sec., acceleration from 41 to 53 per 10 sec. *After physostigma*, in 22 min., slowing to 48 per 10 sec.; in 29 min., to 40; and in 35 min., to 38. Further changes were not observed.	*With atropia*, none. *After physostigma*, the original rate of 16 per 10 sec. was present at 22 min.; slowing then occurred, and in 1 hour 5 min., only gasps occurred 3 times in 10 sec.	*With atropia*, none. *After physostigma*, none. No salivation, defæcation, nor urination at any time.	*With atropia*, none. *After physostigma*, in 12 min., slight paralysis; in 30 min., decided paralysis; and in 54 min., general flaccidity. No spasms occurred, and but slight fibrillary twitches at only the earlier part of the experiment.
86.	3 lbs.	5·4	5·4	1·2	Death, in 50 min. after the administration of physostigma.	*With atropia*, in 3 min., dilatation from $\frac{12}{50} \times \frac{11}{50}$ to $\frac{15}{50} \times \frac{15}{50}$. *After physostigma*, in 3 min., further dilatation to $\frac{17}{50} \times \frac{17}{50}$; this size was maintained until 18 min.; but in 32 min., $\frac{15}{50} \times \frac{15}{50}$, and this size was maintained until death.—After death, in 1 min., $\frac{13}{50} \times \frac{13}{50}$; in 3 min., $\frac{11}{50} \times \frac{10}{50}$; in 5 min., $\frac{9}{50} \times \frac{8}{50}$; and in 20 min., $\frac{5}{50} \times \frac{4}{50}$.	*With atropia*, in 4 min. 30 sec., acceleration from 39 to 49 per 10 sec. *After physostigma*, no observation was made until 27 min., when the rate was 45 per 10 sec.	*With atropia*, none. *After physostigma*, slowing occurred from the original rate per 10 sec. of 19; in 10 min., to 16; in 20 min., to 13; in 37 min., to 11; in 42 min., to 8; and in 49 min., to 2 feeble gasps per 10 sec.	*With atropia*, none. *After physostigma*, none. No salivation, defæcation, nor urination at any time.	*With atropia*, none. *After physostigma*, in 8 min., slight paralysis; in 13 min., decided paralysis, and occasionally tremors; in 36 min., spasms; and in 40 min., general flaccidity. Only soon after the injection of physostigma, slight fibrillary twitches occurred.
87.	3 lbs.	5·5	5·5	1·2	Death, in 1 hour 25 min. after the administration of physostigma.	*With atropia*, in 3 min. 30 sec., dilatation from $\frac{14}{50} \times \frac{13}{50}$ to $\frac{16}{50} \times \frac{16}{50}$. *After physostigma*, in 20 min., further dilatation to $\frac{17}{50} \times \frac{17}{50}$, and in 1 hour 17 min. to $\frac{15}{50} \times \frac{13}{50}$.—After death, in 45 min., contraction to $\frac{10}{50} \times \frac{10}{50}$ had occurred.	*With atropia*, in 4 min., acceleration from 39 to 52 per 10 sec. *After physostigma*, in 30 min., slowing to 41; and in 58 min., to 31 per 10 sec. Further observations were not made, as the contact of the hand excited tremors, and greatly distressed the rabbit.	*With atropia*, in 4 min. 20 sec., slowing from 19 to 17 per 10 sec. *After physostigma*, in 18 min., acceleration to 33; in 54 min., slowing to 15; and in 1 hour 19 min., to 6 per 10 sec.	*With atropia*, none. *After physostigma*, in 3 min., several normal fæcal pellets were passed; otherwise, no effect.	*With atropia*, none. *After physostigma*, in 18 min., decided paralysis was present; in 30 min., flaccidity and weak spasms; in 1 hour, great flaccidity, accompanied with spasms; and in 1 hour and 24 min. weak tremors occurred. Slight fibrillary twitches occurred, only shortly after the injection of physostigma.

TABLE 3.—Experiments with One-and-a-Half times the Minimum-Lethal Dose of Physostigma (1·8 *gr. of Extract of Physostigma per Three Pounds Weight of Rabbit.*)

Number of Experiment.	Weight of Rabbit	Doses of Sulphate of Atropia (in Grains). Actual Dose.	Doses of Sulphate of Atropia (in Grains). Dose p. 3 lbs. of Animal	Dose of Physostigma (in Grains). Actual Dose of Extract.	Result.	Effect on the Pupils. (The Measurements are in fiftieths of an inch.)	Effect on the Heart.	Effect on the Respirations.	Effect on Secretion and Excretion.	Effects on Motility, &c.
88.	3 lbs. 2 oz.	0·015	0·014	0·187	Death, in 23 min. after the administration of physostigma.	*With atropia*, in 4 min., dilatation from $\frac{14}{50} \times \frac{13}{50}$ to $\frac{15}{50} \times \frac{15}{50}$. *After physostigma*, in 3 min., further dilatation to $\frac{18}{50} \times \frac{16}{50}$; subsequently contraction.	*With atropia*, in 4 min. 20 sec., acceleration from 34 to 44 per 10 sec. *After physostigma*, in 16 min., slowing to 37 per 10 sec. No further observations were made.	*With atropia*, in 4 min. 30 sec., slowing from 22 to 18 per 10 sec. *After physostigma*, in 4 min., acceleration to 19; and in 18 min., slowing to 16 per 10 sec. The slowing continued until death.	*With atropia*, none. *After physostigma*, in 14 min., increase of bronchial, laryngeal, and salivary secretions. This increase became greater as death approached.	*With atropia*, none. *After physostigma*, fibrillary twitches, which soon became very well marked. In 7 min., slight paralysis; in 10 min., decided paralysis and tremors; and in 15 min., flaccidity, accompained with tremors and weak spasms.
89.	3 lbs. 1 oz.	0·015	0·015	0·18	Death, in 32 min. after the administration of physostigma.	*With atropia*, none. *After physostigma*, in 3 min., further dilatation to $\frac{18}{50} \times \frac{18}{50}$; in 20 min., contraction to $\frac{13}{50} \times \frac{11}{50}$; in 25 min., to $\frac{9}{50} \times \frac{8}{50}$; in 28 min., to $\frac{7}{50} \times \frac{6}{50}$; and in 30 min., to $\frac{4}{50} \times \frac{5}{50}$.—At death, the size was $\frac{7}{50} \times \frac{6}{50}$; in 3 min. afterwards, $\frac{4}{50} \times \frac{5}{50}$; and in 8 min., $\frac{10}{50} \times \frac{10}{50}$.	*With atropia*, in 4 min. 30 sec., acceleration from 45 to 48 per 10 sec. *After physostigma*, in 19 min., slowing to 32 per 10 sec., and the slowing increased until death.	*With atropia*, none. *After physostigma*, slowing, then acceleration, and then slowing occurred. In 28 min., only 9 laboured and noisy gasps occurred per 10 sec.; and in 30 min., about 2 per 10 sec.	*With atropia*, none. *After physostigma*, in 17 min., slight salivation, which increased gradually; and in 28 min., several wet fæcal pellets were passed.	*With atropia*, none. *After physostigma*, fibrillary twitches, which soon became very well marked. In 8 min., weakness; and in 10 min., decided paralysis, which quickly increased. Tremors and weak starts frequently occurred.
90. *a* [Experiment *b* was performed eleven days after experiment *a*.]	3 lbs. 1 oz.	0·02	0·02	1·83	Recovery.	*With atropia*, none noted. *After physostigma*, none noted.	*With atropia*, in 4 min. 30 sec., acceleration from 38 to 42 per 10 sec. *After physostigma*, considerable slowing occurred.	*With atropia*, in 3 min., slowing from 21 to 17 per 10 sec. *After physostigma*, none noted.	*With atropia*, none. *After physostigma*, urine was voided, and a few normal fæcal pellets passed; and considerable salivation occurred.	*With atropia*, none. *After physostigma*, in 16 min., decided paralysis, which continued for more than 40 min. Fibrillary twitches were very well marked.
b	3 lbs. 5 oz.	0	0	1·3 (= 1·2 gr. p. 3 lbs.)	Death, in 24 min.	—	—	—	—	—
91.	3 lbs.	0·02	0·02	1·8	Death, in more than 2 hours after the administration of physostigma.*	*With atropia*, in 4 min. 30 sec., dilatation from $\frac{13}{50} \times \frac{14}{50}$ to $\frac{16}{50} \times \frac{15}{50}$. *After physostigma*, in 8 min., further dilatation to $\frac{17}{50} \times \frac{17}{50}$; and in 14 min., to $\frac{18}{50} \times \frac{18}{50}$. Afterwards, contraction, which in 1 hour 35 min. had reached $\frac{13}{50} \times \frac{12}{50}$.	*With atropia*, in 4 min., acceleration from 42 to 48 per 10 sec. *After physostigma*, slowing occurred; and in 35 min. the rate per 10 sec. was 45, while in 1 hour 50 min. it was 26.	*With atropia*, in 4 min. 20 sec., slowing from 35 to 31 per 10 sec. *After physostigma*, slowing occurred; and in 35 min. the rate per 10 sec. was 22; while in 1 hour and 26 min., it was 9.	*With atropia*, none. *After physostigma*, in 17 min., several normal fæcal pellets; soon afterwards salivation occurred, and continued along with the increased secretion of other buccal glands until after 1 hour and 50 min.	*With atropia*, none. *After physostigma*, in 8 min., distinct paralysis; and in 13 min., well marked paralysis, which continued along with gentle tremors for more than 2 hours. Fibrillary twitches were present during all this time in an exaggerated form.

* In this experiment, the observations were interrupted after 2 hours.

Number of Experiment.	Weight of Rabbit.	Doses of Sulphate of Atropia (in Grains). Actual Dose.	Doses of Sulphate of Atropia (in Grains). Dose p. 3 lbs. of Animal.	Dose of Physostigma (in Grains). Actual Dose of Extract.	Result.	Effect on the Pupils. (The Measurements are in fiftieths of an inch.)	Effect on the Heart.	Effect on the Respirations.	Effect on Secretion and Excretion.	Effects on Motility, &c.
92. *a* [Experiment *b* was performed ten days after experiment *a*.]	3 lbs.	0·02	0·02	1·8	Recovery.	*With atropia*, in 4 min., dilatation from $\frac{10}{50} \times \frac{9}{50}$ to $\frac{11}{50} \times \frac{10}{50}$. *After physostigma*, further dilatation, until in 12 min. the size was $\frac{15}{50} \times \frac{15}{50}$; then contraction, until in 43 min., the size was $\frac{13}{50} \times \frac{13}{50}$.	*With atropia*, in 4 min. 30 sec., acceleration from 40 to 44 per 10 sec. *After physostigma*, no observation was made until the following day, when the rate was 39 per 10 sec.	*With atropia*, in 4 min. 40 sec., acceleration from 24 to 27 per 10 sec. *After physostigma*, the rate was slowed, at 34 min. to 20, and at 45 min. to 19 per 10 sec.	*With atropia*, none. *After physostigma*, in 6 and in 14 min., several normal fæcal pellets; in 48 min., several large and soft pellets; and in 1 hour 28 min., urine was voided. In 13 min., slight salivation, and soon afterwards great increase of the secretion of other buccal glands also.	*With atropia*, none. *After physostigma*, in 9 min., distinct paralysis; in 14 min., well-marked paralysis; and soon tremors and spasms also occurred. Fibrillary twitchings were present for more than 2 hours in an exaggerated form.
	b 3 lbs.	0	0	1·2	Death, in 29 min.	—	—	—	—	—
93. *a* [Experiment *b* was performed eleven days after experiment *a*.]	3 lbs.	0·03	0·03	1·8	Recovery.	*With atropia*, in 3 min., dilatation from $\frac{14}{50} \times \frac{13}{50}$ to $\frac{15}{50} \times \frac{14}{50}$. *After physostigma*, in 5 min., further dilatation to $\frac{16}{50} \times \frac{15}{50}$; then contraction, until in 1 hour and 30 min., the size was $\frac{14}{50} \times \frac{14}{50}$.	*With atropia*, in 4 min., acceleration from 44 to 51 per 10 sec. *After physostigma*, slowing occurred, until in 1 hour and 30 min., the rate per 10 sec. was 32.	*With atropia*, none noted. *After physostigma*, a rapid rate was maintained until about 1 hour and 30 sec., but the rate could not be ascertained because of fibrillary twitches and frequent tremors.	*With atropia*, none. *After physostigma*, in 26 min., normal fæcal pellets and urine; and in 1 hour 20 min., wet fæces and more urine. In 31 min., salivation became evident and continued, with increased secretion from other buccal glands, until 1 hour 5 min.	*With atropia*, none. *After physostigma*, in 7 min., extension of the limbs; and in 10 min., distinct paralysis, which had diminished in 1 hour 30 min. Tremors and starts frequently occurred, and very well-marked fibrillary twitches were present.
	b 3 lbs. 2 oz.	0	0	1·25 (= 1·2 gr. p. 3 lbs.	Death, in 21 min.	—	—	—	—	—
94. *a* [Experiment *b* was performed seven days after experiment *a*.]	3 lbs. 2 oz.	0·052	0·05	1·87	Recovery.	*With atropia*, in 3 min., dilatation from $\frac{11}{50} \times \frac{10}{50}$ to $\frac{13}{50} \times \frac{13}{50}$. *After physostigma*, some further dilatation, followed by slight contraction.	*With atropia*, in 4 min., acceleration from 36 to 46 per 10 sec. *After physostigma*, no observations could be made on account of the exaggerated fibrillary twitches.	*With atropia*, none. *After physostigma*, none noted.	*With atropia*, none. *After physostigma*, none, except slight increase of salivary secretion, and this only during the first few min.	*With atropia*, none. *After physostigma*, in 9 min., slight paralysis, which, in 30 min., had become very decided, but soon after began to diminish. Fibrillary twitchings were very prominent.
	b 3 lbs.	0	0	1·2	Death, in 18 min.*	—	—	—	—	—
95. *a* [Experiment *b* was performed nine days after experiment *a*.]	3 lbs. 2 oz.	0·052	0·05	1·8	Recovery.	*With atropia*, in 3 min., dilatation from $\frac{14}{50} \times \frac{13}{50}$ to $\frac{16}{50} \times \frac{16}{50}$. *After physostigma*, the above dilatation was maintained; and on the following day, was increased to $\frac{17}{50} \times \frac{17}{50}$.	*With atropia*, in 4 min. 30 sec., acceleration from 45 to 54 per 10 sec. *After physostigma*, the rate per 10 sec. was maintained at about 54 for more than 45 min.	*With atropia*, none noted. *After physostigma*, none noted.	*With atropia*, none. *After physostigma*, none.	*With atropia*, none. *After physostigma*, in 10 min., decided paralysis, which had nearly disappeared at 55 min. Fibrillary twitchings were prominent, and tremors and starts occurred.
	b 3 lbs. 3 oz.	0	0	1·9 (= 1·8 gr. p. 3 lbs.)	Death, in 18 min.	—	—	—	—	—

* The rabbit seemed to be in bad health when experiment *b* was performed.

Number of Experiment.	Weight of Rabbit.	Doses of Sulphate of Atropia (in Grains). Actual Dose.	Doses of Sulphate of Atropia (in Grains). Dose p. 3 lbs. of Animal.	Dose of Physostigma (in Grains). Actual Dose of Extract.	Result.	Effect on the Pupils. (The Measurements are in fiftieths of an inch.)	Effect on the Heart.	Effect on the Respirations.	Effect on Secretion and Excretion.	Effects on Motility, &c.
96. *a*	3 lbs. 1 oz. [Experiment *b* was performed ten days after experiment *a*.]	1·53	1·5	1·83	Recovery.	*With atropia*, in 3 min., dilatation from $\frac{11}{50} \times \frac{10}{50}$ to $\frac{15}{50} \times \frac{16}{50}$. *After physostigma*, the above dilatation was maintained for more than 3 hours 30 min.	*With atropia*, in 4 min. 30 sec., acceleration from 39 to 50 per 10 sec. *After physostigma*, no observation was made until 2 hours, when the rate was 48 per 10 sec. In 3 hours 30 sec. it was 42 per 10 sec.	*With atropia*, in 4 min., acceleration from 17 to 20 per 10 sec. *After physostigma*, slowing occurred, and at 1 hour the rate was 14 per 10 sec.	*With atropia*, none. *After physostigma*, none. Neither defæcation nor urination occurred, nor were the secretions of the salivary or other buccal glands increased during the 3 hours and 30 min. that continuous observation lasted.	*With atropia*, none. *After physostigma*, in 8 min., slight paralysis; and in 20 min., decided paralysis. Weak starts and tremors occurred frequently after 20 min., and slight fibrillary twitches appeared in 9 min., and continued for about 30 min. A normal general condition was present in 3 hours and 30 min.
b	3 lbs. 2 oz.	0	0	1·25 (= 1·2 gr. p. 3 lbs.)	Death, in 23 min.	—	—	—	—	—
97. *a*	3 lbs. [Experiment *b* was performed nine days after experiment *a*.]	2·	2·	1·8	Recovery.	*With atropia*, in 3 min., dilatation from $\frac{15}{50} \times \frac{15}{50}$ to $\frac{17}{50} \times \frac{17}{50}$. *After physostigma*, in 2 min., further dilatation to $\frac{18}{50} \times \frac{18}{50}$, and this size was maintained for more than 3 hours.	*With atropia*, in 4 min. 10 sec., acceleration from 43 to 58 per 10 sec. *After physostigma*, no observation was made until 3 hours, when the rate was 52 per 60 sec. —On the following day, the rate was 43 per 10 sec.	*With atropia*, none noted. *After physostigma*, only a slight slowing occurred.	*With atropia*, none. *After physostigma*, none. Neither defæcation nor urination occurred, nor were the secretions of the salivary or other buccal glands increased during the 3 hours that continuous observation lasted.	*With atropia*, none. *After physostigma*, in 20 min., slight paralysis, which became pretty decided in 30 min., began to diminish in 45 min., and had disappeared in 3 hours. Slight fibrillary twitches were present for a short time after the administration of physostigma.
b	3 lbs.	0	0	1·8	Death, in 17 min.	—	—	—	—	—
98. *a*	3 lbs. 6 oz. [Experiment *b* was performed eight days after experiment *a*.]	2·92	2·6	2·02	Recovery.	*With atropia*, in 4 min., dilatation from $\frac{15}{50} \times \frac{15}{50}$ to $\frac{17}{50} \times \frac{17}{50}$. *After physostigma*, the above dilatation was maintained for several days.	*With atropia*, in 4 min. 30 sec., acceleration from 38 to 45 per 10 sec. *After physostigma*, in 3 min., there was further acceleration to 52; in 34 min., the rate per 10 sec. was 50; in 1 hour 52 min., 45; and in 2 hours 20 min., 43.—On the following day, the rate was 40 per 10 sec.	*With atropia*, in 4 min. 10 sec., acceleration from 15 to 17 per 10 sec. *After physostigma*, first slowing occurred in 24 min., to 13; and in 1 hour 15 min., to 12: afterwards, the rate increased to 15 per 10 sec.	*With atropia*, none. *After physostigma*, none. Neither defæcation nor urination occurred, nor were any secretions increased during the 2 hours and 30 min. that the observations lasted.	*With atropia*, none. *After physostigma*, in 14 min., slight paralysis, which became greater in 20 min., and had not altogether disappeared in 2 hours 30 min. Tremors and slight spasms occasionally took place. No fibrillary twitches were present after 24 min.
b	3 lbs. 6 oz.	0	0	1·35 (= 1·2 gr. p. 3 lbs.	Death, in 26 min.	—	—	—	—	—

Number of Experiment.	Weight of Rabbit.	Doses of Sulphate of Atropia (in Grains). Actual Dose.	Doses of Sulphate of Atropia (in Grains). Dose p. 3 lbs. of Animal.	Dose of Physostigma (in Grains). Actual Dose of Extract.	Result.	Effect on the Pupils. (The Measurements are in fiftieths of an inch.)	Effect on the Heart.	Effect on the Respirations.	Effect on Secretion and Excretion.	Effects on Motility, &c.
99. *a*	3 lbs. 6 oz. [Experiment *b* was performed twelve days after experiment *a*.]	3·7	3·3	2·02	Recovery.	*With atropia*, in 3 min., dilatation from $\frac{1}{50} \times \frac{5}{50}$ to $\frac{1}{50} \times \frac{1}{50}$. *After physostigma*, in 2 min., further dilatation to $\frac{1}{50} \times \frac{1}{50}$, which size was maintained for several days.	*With atropia*, in 4 min. 30 sec., acceleration from 41 to 53 per 10 sec. *After physostigma*, no observation was made until 36 min., when the rate was 49 per 10 sec.	*With atropia*, in 4 min., slowing from 20 to 18 per 10 sec. *After physostigma*, further slowing, and in 40 min. the rate was 11 per 10 sec.	*With atropia*, none. *After physostigma*, none.	*With atropia*, none. *After physostigma*, in 10 min., slight paralysis; in 30 min., decided paralysis, which, though diminished, continued for more than 1 hour and 40 min. Slight tremors and starts occurred. Fibrillary twitches were present for only a short time at the commencement.
b	3 lbs. 9 oz.	0	0	1·4 (= 1·2 gr. p. 3 lbs.)	Death, in 30 min.	—	—	—	—	—
100. *a*	3 lbs. 2 oz. [Experiment *b* was performed twelve days after experiment *a*.]	4·27	4·1	1·87	Recovery.	*With atropia*, in 4 min. 30 sec., dilatation from $\frac{12}{50} \times \frac{11}{50}$ to $\frac{17}{50} \times \frac{17}{50}$. *After physostigma*, the above dilatation was maintained for more than 2 hours.	*With atropia*, in 4 min., acceleration from 39 to 56 per 10 sec. *After physostigma*, slowing occurred; the rate per 10 sec. was in 37 min., 41; and in 2 hours, 37.—On the following day the rate was 44 per 10 sec.	*With atropia*, in 3 min. 30 sec., slowing from 17 to 9 per 10 sec. *After physostigma*, no material change occurred.	*With atropia*, none. *After physostigma*, none.	*With atropia*, none. *After physostigma*, in 7 min., slight paralysis; in 12 min., decided paralysis, which had not disappeared in 2 hours 37 min. Fibrillary twitches were present during only the first 10 min. No tremors nor starts.
b	3 lbs. 4 oz.	0	0	1·3 (= 1·2 gr. p. 3 lbs.	Death, in 19 min.	—	—	—	—	—
101.	3 lbs. 1 oz.	4·38	4·3	1·83	Death, in 1 hour and 26 min. after the administration of physostigma.	*With atropia*, in 4 min. 30 sec., dilatation from $\frac{1}{50} \times \frac{5}{50}$ to $\frac{1}{50} \times \frac{1}{50}$. *After physostigma*, the size continued at $\frac{1}{50} \times \frac{1}{50}$ until death.	*With atropia*, in 4 min., acceleration from 32 to 49 per 10 sec. *After physostigma*, the rate per 10 sec. was in 37 min., 45; in 52 min., 38; in 1 hour, 34; and in 1 hour 20 min., 18.	*With atropia*, none. *After physostigma*, slowing from the original rate per 10 sec. of 14, to, in 10 min., 11; in 40 min., 9; and in 1 hour and 20 min., 3.	*With atropia*, none. *After physostigma*, in 4 min., several normal fæcal pellets; otherwise no effect on secretion or excretion.	*With atropia*, none. *After physostigma*, in 9 min., slight paralysis; and in 20 min., decided paralysis, which increased until death. Tremors and weak spasms occurred frequently, and fibrillary twitches during only the first 30 min.

TABLE 4.—EXPERIMENT WITH TWICE THE MINIMUM-LETHAL DOSE OF PHYSOSTIGMA (2·4 *grs. of Extract of Physostigma per Three Pounds Weight of Rabbit*).

Number of Experiment.	Weight of Rabbit.	Doses of Sulphate of Atropia (in Grains). Actual Dose.	Doses of Sulphate of Atropia (in Grains). Dose p. 3 lbs. of Animal.	Dose of Physostigma (in Grains.) Actual Dose of Extract.	Result.	Effect on the Pupils. (The Measurements are in fiftieths of an inch.)	Effect on the Heart.	Effect on the Respirations.	Effect on Secretion and Excretion.	Effects on Motility, &c.
102.	3 lbs. 3 oz.	0·02	0·019	2·6	Death, in 39 min. after the administration of physostigma.	*With atropia*, in 4 min., dilatation from $\frac{15}{50} \times \frac{14}{50}$ to $\frac{16}{50} \times \frac{16}{50}$. *After physostigma*, in 3 min., further dilatation to $\frac{18}{50} \times \frac{18}{50}$; afterwards contraction—in 16 min., to $\frac{13}{50} \times \frac{12}{50}$; and in 24 min. to $\frac{7}{50} \times \frac{6}{50}$.	*With atropia*, in 4 min. 30 sec., acceleration from 45 to 54 per 10 sec. *After physostigma*, no observations were made on account of the severity of the general symptoms.	*With atropia*, none. *After physostigma*, no exact observations were made until 25 min., when slowing had occurred to 8 per 10 sec.; in 30 min. to 6; and in 34 min. to 5 feeble gasps per 10 sec.	*With atropia*, none. *After physostigma*, none.	*With atropia*, none. *After physostigma*, in 8 min., tremors and distinct paralysis: the latter increased until death; the former were very severe until 24 min., and they then became less so, but continued until death. Fibrillary twitches appeared very early, became prominently developed, and continued so until death.
103.	3 lbs.	0·02	0·02	2·4	Death, in 42 min. after the administration of physostigma.	*With atropia*, in 4 min., dilatation from $\frac{15}{50} \times \frac{14}{50}$ to $\frac{17}{50} \times \frac{17}{50}$. *After physostigma*, the size was in 12 min., $\frac{17}{50} \times \frac{17}{50}$; in 17 min., $\frac{14}{50} \times \frac{13}{50}$; and in 19 min., $\frac{10}{50} \times \frac{9}{50}$.	*With atropia*, in 4 min. 30 sec., acceleration from 45 to 52 per 10 sec. *After physostigma*, no observations were made on account of the severity of the general symptoms.	*With atropia*, none. *After physostigma*, the rate was in 20 min., 13 per 10 sec., and shallow and interrupted by tremors; and in 32 min., 6 per 10 sec.	*With atropia*, none. *After physostigma*, in 20 min., several normal fæcal pellets. No salivation occurred, nor was increase of the secretion of any gland observed.	*With atropia*, none. *After physostigma*, in 8 min., decided paralysis, and soon afterwards tremors occurred. Fibrillary twitches were present until death.
104.	2 lbs. 15 oz.	0·02	0·02	2·35	Death, in 39 min. after the administration of physostigma.	*With atropia*, in 4 min., dilatation from $\frac{14}{50} \times \frac{12}{50}$ to $\frac{13}{50} \times \frac{14}{50}$. *After physostigma*, the size was in 6 min., $\frac{15}{50} \times \frac{15}{50}$; in 11 min., $\frac{14}{50} \times \frac{14}{50}$; in 16 min., $\frac{13}{50} \times \frac{12}{50}$; and in 31 min., $\frac{6}{50} \times \frac{4}{50}$.—After death, in 2 min., $\frac{5}{50} \times \frac{4}{50}$; and in 8 min., $\frac{11}{50} \times \frac{10}{50}$.	*With atropia*, in 4 min. 40 sec., acceleration from 45 to 46 per 10 sec. *After physostigma*, no observations were made on account of the severity of the general symptoms.	*With atropia*, none. *After physostigma*, first, acceleration; and afterwards slowing, which latter continued until death.	*With atropia*, none. *After physostigma*, in 15 min., defæcation and salivation; the latter soon increased, and along with an increase in the secretion of other buccal glands, greatly embarrassed the respiratory movements.	*With atropia*, none. *After physostigma*, in 7 min., distinct paralysis; and in 15 min., decided paralysis; along with which, in 18 min., tremors, which often recurred until death. Fibrillary twitches soon became prominently developed, and continued so until death.
105.	3 lbs. 7 oz.	0·025	0·021	2·7	Death, in 25 min. after the administration of physostigma.	*With atropia*, none observed. *After physostigma*, in 3 min., dilatation from original size of $\frac{15}{50} \times \frac{14}{50}$ to $\frac{18}{50} \times \frac{18}{50}$; in 8 min., contraction to $\frac{13}{50} \times \frac{13}{50}$; and in 11 min., to $\frac{6}{50} \times \frac{4}{50}$.	*With atropia*, none observed. *After physostigma*, in 4 min., slowing from the original rate per 10 sec. of 33 to that of 26. Further observations were not made on account of the severity of the general symptoms.	*With atropia*, in 4 min., acceleration from 18 to 22 per 10 sec. *After physostigma*, in 18 min., slowing to 16 per 10 sec.; in 21 min., 8 laboured and noisy gasps per 10 sec.; and in 24 min., 2 laboured and feeble gasps per 10 sec.	*With atropia*, none. *After physostigma*, in 8 min., increased secretion from buccal glands, and soon afterwards salivation, both of which continued until death. Neither defæcation nor urination occurred.	*With atropia*, none. *After physostigma*, in 7 min., slight paralysis; and in 9 min., decided paralysis, which soon became accompanied with tremors and spasms. Fibrillary twitches early became prominent, and continued until death.

Number of Experiment.	Weight of Rabbit.	Doses of Sulphate of Atropia (in Grains). Actual Dose.	Doses of Sulphate of Atropia (in Grains). Dose p. 3 lbs. of Animal.	Dose of Physostigma (in Grains). Actual Dose of Extract.	Result.	Effect on the Pupils. (The Measurements are in fiftieths of an inch.)	Effect on the Heart.	Effect on the Respirations.	Effect on Secretion and Excretion.	Effects on Motility, &c.
106. *a* [Experiment *b* was performed seven days after experiment *a*.]	3 lbs.	0·025	0·025	2·4	Recovery.	*With atropia*, in 4 min. 30 sec., dilatation from $\frac{14}{50} \times \frac{13}{50}$ to $\frac{18}{50} \times \frac{16}{50}$. *After physostigma*, in 3 min., further dilatation to $\frac{18}{50} \times \frac{18}{50}$, which size continued for more than 2 hours.—On the following day the size was $\frac{12}{50} \times \frac{11}{50}$.	*With atropia*, in 4 min. 40 sec., acceleration from 43 to 50 per 10 sec. *After physostigma*, in 5 min., further acceleration to 52, which rate was maintained for 1 hour 40 min.—On the following day, the rate per 10 sec. was 30.	*With atropia*, none observed. *After physostigma*, a slight slowing occurred.	*With atropia*, none. *After physostigma*, none observed.	*With atropia*, none. *After physostigma*, in 7 min., slight paralysis and tremors; and in 10 min., slight paralysis, tremors, and spasms. The paralysis and spasms continued until 1 hour and 25 min., when they began to diminish, and had almost disappeared at 1 hour 40 min. Fibrillary twitches early became prominent, and continued for more than 26 hours, though latterly in only a slight form.
	b 3 lbs.	0	0	1·2	Death, in 12 min.	—	—	—	—	—
107.	3 lbs.	0·03	0·03	2·4	Death, in 13 min. after the administration of physostigma.	*With atropia*, in 4 min., dilatation from $\frac{18}{50} \times \frac{8}{50}$ to $\frac{13}{50} \times \frac{11}{50}$. *After physostigma*, in 6 min., further dilatation to $\frac{15}{50} \times \frac{15}{50}$; and then contraction, in 10 min., to $\frac{6}{50} \times \frac{5}{50}$.	*With atropia*, in 4 min. 30 sec., acceleration from 36 to 42 per 10 sec. *After physostigma*, no observation was made on account of the severity of the general symptoms.	*With atropia*, none observed. *After physostigma*, at first, acceleration, and then slowing.	*With atropia*, none. *After physostigma*, none observed.	*With atropia*, none. *After physostigma*, in 8 min., very energetic and excited movements, followed in 10 min. by exhaustion and flaccidity. Fibrillary twitches were but slightly developed.
108. *a* [Experiment *b* was performed six days after experiment *a*.]	2 lbs. 15 oz.	0·04	0·04	2·35	Recovery.	*With atropia*, in 3 min., dilatation from $\frac{13}{50} \times \frac{12}{50}$ to $\frac{14}{50} \times \frac{14}{50}$. *After physostigma*, in 2 min., further dilatation to $\frac{17}{50} \times \frac{17}{50}$, which size continued for more than 1 hour 30 min.—On the following day, the size was $\frac{15}{50} \times \frac{15}{50}$; and on the 3d day, $\frac{14}{50} \times \frac{13}{50}$.	*With atropia*, in 4 min. 30 sec., acceleration from 39 to 43 per 10 sec. *After physostigma*, no observations were made until 1 hour 20 min., when the rate was 44 per 10 sec.	*With atropia*, none observed. *After physostigma*, no marked effect was produced.	*With atropia*, none. *After physostigma*, in 5 min., slight increase of buccal secretions, but this ceased in 15 min. No defæcation nor urination for more than 1 hour 30 min.	*With atropia*, none. *After physostigma*, in 6 min., slight paralysis; and in 23 min., decided paralysis, which in 50 min. had greatly diminished. Fibrillary twitches early appeared, and continued for more than 1 hour and 20 min.
	b 3 lbs.	0	0	1·2	Death, in 14 min.	—	—	—	—	—

Number of Experiment.	Weight of Rabbit.	Doses of Sulphate of Atropia (in Grains). Actual Dose.	Doses of Sulphate of Atropia (in Grains). Dose p. 3 lbs. of Animal	Dose of Physostigma (in Grains). Actual Dose of Extract.	Result.	Effect on the Pupils. (The Measurements are in fiftieths of an inch.)	Effect on the Heart.	Effect on the Respirations.	Effect on Secretion and Excretion.	Effects on Motility, &c.
109. *a*	3 lbs. 1 oz. [Experiment *b* was performed six days after experiment *a*.]	0·05	0·05	2·45	Recovery.	*With atropia*, in 3 min. 30 sec., dilatation from $\frac{11}{50} \times \frac{10}{50}$ to $\frac{14}{50} \times \frac{14}{50}$. *After physostigma*, in 3 min., further dilatation to $\frac{15}{50} \times \frac{15}{50}$, which continued for more than 2 hours 30 min.—On the following day the size was $\frac{14}{50} \times \frac{14}{50}$; and on the 5th day, $\frac{11}{50} \times \frac{10}{50}$.	*With atropia*, in 4 min. 30 sec., acceleration from 39 to 49 per 10 sec. *After physostigma*, no observations could be made until 1 hour 25 min., when the rate per 10 sec. was 49; in 2 hours it was 48; and in 2 hours 20 min., 48.—On the following day the rate per 10 sec. was 29; on the 5th day, 39; and on the 6th day, 40.	*With atropia*, in 3 min., acceleration from 29 to 33 per 10 sec. *After physostigma*, slowing occurred until in 1 hour 25 min., the rate per 10 sec. was 23; in 2 hours it was 21; and in 2 hours 20 min., 22.—On the following day the rate per 10 sec. was 20; and on the 6th day, 21.	*With atropia*, none. *After physostigma*, none. Neither defæcation nor urination occurred for more than 2 hours 30 min., nor was the secretion of the salivary or other buccal glands increased.	*With atropia*, none. *After physostigma*, in 6 min., slight paralysis, which, gradually increasing, reached its height in 25 min., and began to diminish in 50 min. Tremors occurred during this time; and fibrillary twitches appeared in a prominent form, and continued for more than 2 hours and 20 min.
b	3 lbs.	0	0	1·2	Death, in 23 min.	—	—	—	—	—
110 *a*	3 lbs. 2 oz. [Experiment *b* was performed ten days after experiment *a*.]	0·31	0·3	2·5	Recovery.	*With atropia*, in 3 min., dilatation from $\frac{13}{50} \times \frac{12}{50}$ to $\frac{15}{50} \times \frac{15}{50}$. *After physostigma*, in 2 min., further dilatation to $\frac{16}{50} \times \frac{16}{50}$, which remained for more than 1 hour 20 min.—On the following day the size was $\frac{17}{50} \times \frac{17}{50}$; on the 4th day, $\frac{14}{50} \times \frac{13}{50}$; and on the 6th day, $\frac{13}{50} \times \frac{13}{50}$.	*With atropia*, in 3 min. 30 sec., acceleration from 45 to 56 per 10 sec. *After physostigma*, no observations were made until the following day, when the rate per 10 sec. was 46; on the 3d day it was 38; and on the 4th day, 40.	*With atropia*, none observed. *After physostigma*, no observations were made.	*With atropia*, none. *After physostigma*, none observed during the following 2 hours.	*With atropia*, none. *After physostigma*, in 16 min., distinct paralysis; and in 22 min., well-marked paralysis. No tremors were observed durthe 2 hours that the observations lasted. Fibrillary twitches early became prominent, and continued so for more than 1 hour and 50 min.
b	3 lbs. 4 oz.	0	0	1·3 (= 1·2 gr. p. 3 lbs.)	Death, in 18 min.	—	—	—	—	—
111. *a*	2 lbs. 15½ oz. [Experiment *b* was performed eleven days after experiment *a*.]	1·	1·	2·4	Recovery.	*With atropia*, in 2 min. 30 sec., dilatation from $\frac{13}{50} \times \frac{9}{50}$ to $\frac{14}{50} \times \frac{14}{50}$. *After physostigma*, in 2 min., further dilatation to $\frac{15}{50} \times \frac{14}{50}$; in 16 min., contraction to $\frac{14}{50} \times \frac{14}{50}$; in 30 min., to $\frac{13}{50} \times \frac{13}{50}$; in 40 min., to $\frac{12}{50} \times \frac{12}{50}$; and in 1 hour, to $\frac{12}{50} \times \frac{9}{50}$, which size was continued until at least 2 hours 20 min.—On the following day the size was $\frac{12}{50} \times \frac{11}{50}$; and on the 4th day, $\frac{11}{50} \times \frac{10}{50}$.	*With atropia*, in 4 min. 30 sec., acceleration from 41 to 52 per 10 sec. *After physostigma*, in 7 min., the rate per 10 sec. was 53; in 35 min., 53; in 1 hour, 37; in 1 hour 30 min., 28; and in 2 hours 25 min., 27.—On the following day the rate per 10 sec. was 52; on the 3d day, 45; and on the 4th day, 41.	*With atropia*, none. *After physostigma*, in 14 min., slowing from the original rate of 20 per 10 sec. to 15; and in 1 hour 30 min. the rate per 10 sec. was 14.—On the following day the rate per 10 sec. was 18; and on the 4th day, 20.	*With atropia*, none. *After physostigma*, several normal fæcal pellets were passed in 48 min., and also in 1 hour. In 1 hour 8 min., wet fæcal pellets and urine; and after 2 hours occasionally a few drops of urine were voided. The secretion of the buccal glands was not increased.	*With atropia*, none. *After physostigma*, in 12 min., slight paralysis; in 30 min., decided though not very great paralysis; and in 1 hour, decided diminution in the paralysis, which had almost disappeared in 1 hour and 20 min. No tremors nor spasms occurred. Fibrillary twitches early became developed, but had nearly disappeared in 1 hour 20 min.
b	2 lbs. 15¾ oz.	0	0	2·35 (= 2·4 grs. p. 3 lbs.)	Death, in 10 min.	—	—	—	—	—

Number of Experiment.	Weight of Rabbit.	Doses of Sulphate of Atropia (in Grains). Actual Dose.	Doses of Sulphate of Atropia (in Grains). Dose p. 3 lbs. of Animal.	Dose of Physostigma (in Grains). Actual Dose of Extract.	Result.	Effect on the Pupils. (The Measurements are in fiftieths of an inch.)	Effect on the Heart.	Effect on the Respirations.	Effect on Secretion and Excretion.	Effects on Motility, &c.
112. *a*	3 lbs. [Experiment *b* was performed nineteen days after experiment *a*.]	2·	2·	2·4	Recovery.	*With atropia*, in 4 min., dilatation from $\frac{15}{50} \times \frac{14}{50}$ to $\frac{17}{50} \times \frac{17}{50}$. *After physostigma*, the size continued at $\frac{17}{50} \times \frac{17}{50}$ for the next 4 hours. —On the following day it was $\frac{17}{50} \times \frac{17}{50}$; on the 7th day, $\frac{17}{50} \times \frac{17}{50}$; on the 8th day, $\frac{15}{50} \times \frac{15}{50}$; and on the 20th day, $\frac{16}{50} \times \frac{16}{50}$.	*With atropia*, in 4 min. 30 sec., acceleration from 42 to 59 per 10 sec. *After physostigma*, slowing occurred, and the rate per 10 sec. was in 2 hours, 37.—On the following day it was 36; and on the 3d day, 40.	*With atropia*, none noted. *After physostigma*, slowing occurred from the original rate per 10 sec. of 22 to in 30 min., 14; and in 1 hour, 11.—Afterwards acceleration occurred, and in 2 hours the rate was 16 per 10 sec.	*With atropia*, none. *After physostigma*, in 2 hours, urine was voided, and some slightly pultaceous fæces; and this was repeated in 2 hours 15 min., and in 3 hours 30 min. In 2 hours 40 min., some moist sounds were heard with respiration; otherwise, no increase in secretion of any buccal glands.	*With atropia*, none. *After physostigma*, in 20 min., weakness; in 23 min., slight paralysis; and in 30 min., decided though not severe paralysis. The paralysis began to diminish in 1 hour 40 min., and had disappeared by 2 hours 40 min. Very gentle tremors twice occurred. Fibrillary twitches early became pretty well marked, they, however, had diminished in 40 min., but were still present in 4 hours 10 min.
b	3 lbs.	0	0	1·2	Death, in 17 min.	—	—	—	—	—
113. *a*	3 lbs. 4 oz. [Experiment *b* was performed eleven days after experiment *a*.]	2·49	2·3	2·6	Recovery.	*With atropia*, in 4 min., dilatation from $\frac{13}{50} \times \frac{12}{50}$ to $\frac{16}{50} \times \frac{16}{50}$. *After physostigma*, the dilatation increased to $\frac{18}{50} \times \frac{18}{50}$, and this size was maintained. — On the following day, the size was $\frac{12}{50} \times \frac{12}{50}$; on the 9th day, $\frac{16}{50} \times \frac{16}{50}$; and on the 12th day, $\frac{18}{50} \times \frac{18}{50}$.	*With atropia*, in 4 min. 10 sec., acceleration from 39 to 50 per 10 sec. *After physostigma*, the condition of the animal prevented accurate observations being made. —On the following day, the rate per 10 sec. was 25, and their occurrence irregular; on the 4th day, the rate per 10 sec. was 29; and on the 8th day, 43.	*With atropia*, in 4 min. 40 sec., acceleration from 26 to 32 per 10 sec. *After physostigma*, in 15 min., further acceleration to 40 per 10 sec.; then slowing, in 28 min., to 20; and in 1 hour, to 16.	*With atropia*, none. *After physostigma*, in 4 min., several normal fæcal pellets were passed. No salivation nor increase of any buccal secretion occurred, during the 2 hours 10 min. of continuous observation.	*With atropia*, none. *After physostigma*, in 9 min., weakness; and in 15 min., decided though not severe paralysis. The paralysis increased until about 40 min., but had diminished in 1 hour and 10 min., and was only very slight in 2 hours. Tremors and spasms frequently occurred. Fibrillary twitches were present during only the first 35 min.
b	3 lbs. 3 oz.	0	0	1·28 (= 1·2 gr. p. 3 lbs.)	Death, in 25 min.	—	—	—	—	—
114. *a*	3 lbs. [Experiment *b* was performed nine days after experiment *a*.]	3·	3·	2·4	Recovery.	*With atropia*, in 4 min. 30 sec., dilatation from $\frac{11}{50} \times \frac{10}{50}$ to $\frac{15}{50} \times \frac{15}{50}$. *After physostigma*, the size remained $\frac{15}{50} \times \frac{15}{50}$. —On the following day, it was $\frac{15}{50} \times \frac{15}{50}$; on the 4th day, $\frac{14}{50} \times \frac{14}{50}$; and on the 7th day, $\frac{13}{50} \times \frac{11}{50}$.	*With atropia*, none noted. *After physostigma*, no observations were made until the following day, when the rate per 10 sec. was 51; on the 4th day, it was 46; and on the 7th day, 41.	*With atropia*, none noted. *After physostigma*, slowing from the original rate of 30 per 10 sec. took place, and in 1 hour the rate per 10 sec. was 20.	*With atropia*, none. *After physostigma*, a little urine was twice voided, but no defæcation nor increase in the secretion of any buccal gland occurred.	*With atropia*, none. *After physostigma*, in 15 min., slight paralysis, which gradually increased until flaccidity was nearly present in 50 min.; it afterwards gradually diminished, until it had almost disappeared in 2 hours 40 min. Slight tremors occasionally occurred. Fibrillary twitches early appeared; they had nearly disappeared by 50 min., but again appeared in a well-marked form in 1 hour 40 min.
b	3 lbs. 1 oz.	0	0	1·22 (= 1·2 gr. p. 3 lbs.)	Death, in 27 min.	—	—	—	—	—

Number of Experiment.	Weight of Rabbit.	Doses of Sulphate of Atropia (in Grains). Actual Dose.	Doses of Sulphate of Atropia (in Grains). Dose p. 3 lbs. of Animal.	Dose of Physostigma (in Grains). Actual Dose of Extract.	Result.	Effect on the Pupils. (The Measurements are in fiftieths of an inch.)	Effect on the Heart.	Effect on the Respirations.	Effect on Secretion and Excretion.	Effects on Motility, &c.
115. *a* [Experiment *b* was performed fifteen days after experiment *a*.—The animal was a common wild rabbit.]	3 lbs. 5 oz.	3·53	3·2	2·65	Recovery.	*With atropia*, dilatation occurred. *After physostigma*, further dilatation occurred.	*With atropia*, acceleration occurred. *After physostigma*, none noted.	*With atropia*, none noted. *After physostigma*, slowing occurred, and in 1 hour the rate per 10 sec. was 14—the rate having originally been 22 per 10 sec.	*With atropia*, none. *After physostigma*, none.	*With atropia*, none. *After physostigma*, in 30 min., slight paralysis; which increased and became most marked, though not very severe, in 55 min.; but had disappeared by 2 hours 40 min. Neither spasms nor tremors occurred. Fibrillary twitches were well marked in 14 min., but soon afterwards lessened, and became very slight.
b	3 lbs. 4 oz.	0	0	2·6 (= 2·4 grs. p. 3 lbs.)	Death, in 10 min.	—	—	—	—	—
116.	2 lbs. 15 oz.	3·23	3·3	2·35	Death, in 1 hour 11 min. after the administration of physostigma.	*With atropia*, in 3 min., dilatation from $\frac{13}{50} \times \frac{13}{50}$ to $\frac{15}{50} \times \frac{15}{50}$. *After physostigma*, in 2 min., further dilatation to $\frac{18}{50} \times \frac{18}{50}$, which size remained until death.—After death, in 4 min., contraction had taken place to $\frac{14}{50} \times \frac{14}{50}$; and in 30 min., the size was still $\frac{14}{50} \times \frac{14}{50}$.	*With atropia*, in 4 min., acceleration from 42 to 50 per 10 sec. *After physostigma*, slowing occurred, in 16 min., to 42; and in 57 min. to 31 per 10 sec., after which observations were not made, in order to avoid interference with the respiratory movements.	*With atropia*, in 4 min. 20 sec., slowing from 21 to 19 per 10 sec. *After physostigma*, in 6 min., acceleration to 31 per 10 sec.; and afterwards slowing—in 15 min., to 16; in 1 hour, to 10; in 1 hour 12 min., to 4; and then mere gasps occurred until death.	*With atropia*, none. *After physostigma*, in 17 min., several fæcal pellets were passed for the first and only time. No urination occurred, nor was the secretion of any buccal gland increased.	*With atropia*, none. *After physostigma*, in 9 min., slight paralysis; and in 12 min., decided paralysis, which gradually increased until death. No tremors occurred. Fibrillary twitches were only very slightly developed.
117.	3 lbs.	3·5	3·5	2·4	Death, in 54 min. after the administration of physostigma.	*With atropia*, in 3 min., dilatation from $\frac{14}{50} \times \frac{13}{50}$ to $\frac{19}{50} \times \frac{18}{50}$. *After physostigma*, the size remained $\frac{19}{50} \times \frac{18}{50}$ until death. — After death, contraction took place, in 3 min., to $\frac{15}{50} \times \frac{15}{50}$; in 6 min., to $\frac{14}{50} \times \frac{14}{50}$; in 14 min., to $\frac{13}{50} \times \frac{13}{50}$; and this last size remained for more than other 50 min.	*With atropia*, in 4 min., acceleration from 40 to 58 per 10 sec. *After physostigma*, in 4 min., further acceleration occurred to 60 per 10 sec. Afterwards, slowing took place—in 30 min. to 58, and in 48 min., to 32 per 10 sec.	*With atropia*, none noted. *After physostigma*, slowing took place from the original rate of 22 per 10 sec., to, in 27 min., 10 per 10 sec.; in 43 min., 4 gasps per 10 sec.; and in 53 min., 2 gasps per 10 sec.	*With atropia*, none. *After physostigma*, none.	*With atropia*, none. *After physostigma*, in 10 min., decided paralysis, which increased until death. Feeble tremors and weak spasms early occurred. Very slight fibrillary twitches were seen during the first 10 min. after the administration of physostigma, but they thereafter disappeared.

TABLE 5.—EXPERIMENTS WITH TWO AND A HALF TIMES THE MINIMUM-LETHAL DOSE OF PHYSOSTIGMA (*3 grs. of Extract of Physostigma per Three Pounds Weight of Rabbit*).

Number of Experiment.	Weight of Rabbit.	Doses of Sulphate of Atropia (in Grains). Actual Dose.	Doses of Sulphate of Atropia (in Grains). Dose p. 3 lbs. of Animal	Dose of Physostigma (in Grains). Actual Dose of Extract.	Result.	Effect on the Pupils. (The Measurements are in fiftieths of an inch.)	Effect on the Heart.	Effect on the Respirations.	Effect on Secretion and Excretion.	Effects on Motility, &c.
118.	3 lbs. 5 oz.	0·012	0·011	3·3	Death, in 20 min. after the administration of physostigma.	*With atropia*, in 4 min., dilatation from $\frac{11}{50} \times \frac{10}{50}$ to $\frac{14}{50} \times \frac{13}{50}$. *After physostigma*, in 4 min., further dilatation to $\frac{15}{50} \times \frac{15}{50}$, which remained until 9 min.; contraction soon after occurred, in 10 min. to $\frac{13}{50} \times \frac{13}{50}$; in 11 min. to $\frac{9}{50} \times \frac{8}{50}$; in 15 min. to $\frac{4}{50} \times \frac{3}{50}$; and in 18 min. to $\frac{3}{50} \times \frac{3}{50}$.	*With atropia*, none. *After physostigma*, slowing occurred from the original rate per 10 sec. of 39; in 5 min. to 33; and in 16 min. to 12.	*With atropia*, none. *After physostigma*, the condition of the rabbit prevented accurate observations from being made.	*With atropia*, none. *After physostigma*, in 10 min., normal fæces; in 13 min., salivation, which soon became profuse, and along with an increased secretion of other buccal (and of bronchial?) glands greatly impeded respiration.	*With atropia*, none. *After physostigma*, in 5 min., some stiff extension of the limbs occurred, after which paralysis appeared and increased until death. In 11 min. and frequently afterwards, tremors took place. Fibrillary twitches were early present in a well-marked form.
119.	3 lbs.	0·0187	0·0187	3·	Death, in 28 min. after the administration of physostigma.	*With atropia*, in 4 min., dilatation from $\frac{11}{50} \times \frac{10}{50}$ to $\frac{13}{50} \times \frac{12}{50}$. *After physostigma*, in 5 min., further dilatation to $\frac{15}{50} \times \frac{15}{50}$, and soon afterwards contraction commenced. In 8 min. the size was $\frac{10}{50} \times \frac{10}{50}$; in 9 min., $\frac{7}{50} \times \frac{6}{50}$; and in 27 min., $\frac{3}{50} \times \frac{4}{50}$.—After death the size of $\frac{3}{50} \times \frac{4}{50}$ remained for more than 18 min.	*With atropia*, none. *After physostigma*, slowing occurred from the original rate per 10 sec. of 38, to in 5 min., 31; and in 24 min., 11 per 10 sec.	*With atropia*, none. *After physostigma*, slowing occurred, and the rate per 10 sec. was in 21 min., 10; in 15 min., 3; and afterwards only feeble irregular gasps occurred.	*With atropia*, none. *After physostigma*, neither defecation nor urination occurred; but the secretion of the buccal glands was increased in 11 min. as then moist sounds accompanied the respirations, and continued to do so until death.	*With atropia*, none. *After physostigma*, in 6 min., slight paralysis appeared, which soon became well marked, and increased until death. Tremors and weak spasms frequently occurred, and fibrillary twitches were prominently developed.
120.	3 lbs.	0·025	0·025	3·	Death, in 1 hour 6 min. after the administration of physostigma.	*With atropia*, in 4 min. 30 sec., dilatation from $\frac{15}{50} \times \frac{15}{50}$ to $\frac{16}{50} \times \frac{16}{50}$. *After physostigma*, in 8 min. the size was $\frac{17}{50} \times \frac{17}{50}$; in 41 min., $\frac{14}{50} \times \frac{14}{50}$; in 50 min., $\frac{15}{50} \times \frac{15}{50}$; and in 52 min., $\frac{17}{50} \times \frac{17}{50}$, which size remained until death. — After death in 4 min., the size was $\frac{13}{50} \times \frac{13}{50}$; and in 14 min., $\frac{12}{50} \times \frac{12}{50}$.	*With atropia*, none noted. *After physostigma*, in 45 min., slowing had occurred from the original rate of 41 to 32 per 10 sec.; in 54 min. the rate per 10 sec. was 31; in 1 hour, 27; and in 1 hour 5 min., only rare and very feeble impulses could be felt.	*With atropia*, none. *After physostigma*, slowing occurred. In 40 min. the rate per 10 sec. was 8; in 47 min., 5; and in 54 min., 13. The movements in 54 min. were feeble and gasping, and they continued so until death.	*With atropia*, none. *After physostigma*, none. Neither defæcation nor urination occurred, and there was no evidence of an increase in the secretion of any buccal gland, excepting that at 7 min. after the administration of physostigma, movements of the lips and mouth occurred.	*With atropia*, none. *After physostigma*, in 9 min., decided paralysis, which increased until death, flaccidity being present in 48 min. Slight tremors and starts occasionally took place. Fibrillary twitches were prominent during the greater part of the experiment, but they had almost disappeared in 50 min. after the administration of physostigma.

Number of Experiment.		Weight of Rabbit.	Doses of Sulphate of Atropia (in Grains). Actual Dose.	Doses of Sulphate of Atropia (in Grains). Dose p. 3 lbs. of Animal.	Dose of Physostigma (in Grains). Actual Dose of Extract.	Result.	Effect on the Pupils. (The Measurements are in fifteeths of an inch.)	Effect on the Heart.	Effect on the Respirations.	Effect on Secretion and Excretion.	Effects on Motility, &c.
121.	*a*	3 lbs. [Experiment *b* was performed six days after experiment *a*.]	0·025	0·025	3·	Recovery.	*With atropia*, in 3 min., dilatation from $\frac{13}{15} \times \frac{13}{15}$ to $\frac{15}{15} \times \frac{15}{15}$. *After physostigma*, in 7 min., further dilatation to $\frac{15}{15} \times \frac{15}{15}$, and this size was maintained for more than 1 hour, but in 1 hour 14 min., contraction to $\frac{12}{15} \times \frac{12}{15}$ had occurred.—On the following day the size was $\frac{15}{15} \times \frac{14}{15}$; and on the 4th day, $\frac{13}{15} \times \frac{13}{15}$.	*With atropia*, in 4 min. 30 sec., acceleration from 39 to 45 per 10 sec. *After physostigma*, in 30 min., the rate per 10 sec. was 44.—On the following day it was 36.	*With atropia*, none. *After physostigma*, slowing occurred; and in 20 min. the rate per 10 sec. was 17.	*With atropia*, none. *After physostigma*, in 16 min., urine was voided. In 15 min., moist sounds accompanied the respirations and indicated an increase in the secretion of the buccal glands; but these sounds had ceased in 20 min., and they did not recur.	*With atropia*, none. *After physostigma*, in 7 min., decided paralysis; and in 18 min., general flaccidity, which continued along with tremors until 1 hour, after which the paralysis and tremors diminished, and they had almost disappeared in 2 hours. Fibrillary twitches were present in a very prominent form for more than 2 hours.
	b	3 lbs.	0	0	1·2	Death, in 24 min.	—	—	—	—	—
122.	*a*	4 lbs. 2 oz. [Experiment *b* was performed eleven days after experiment *a*.]	0·037	0·027	4·1	Recovery.	*With atropia*, none noted. *After physostigma*, in 6 min., dilatation from the original size of $\frac{13}{15} \times \frac{11}{15}$ to $\frac{15}{15} \times \frac{15}{15}$; and in 10 min. to $\frac{17}{15} \times \frac{17}{15}$. In 1 hour the size was again $\frac{15}{15} \times \frac{15}{15}$.	*With atropia*, in 4 min. 40 sec., acceleration from 42 to 55 per 10 sec. *After physostigma*, no observation was made until 40 min., when the rate per 10 sec. was 57; and in 1 hour 30 min., it was 54.—On the following day the rate per 10 sec. was 39; and on the 3d day, 41.	*With atropia*, in 4 min., acceleration from 25 to 30 per 10 sec. *After physostigma*, the acceleration was maintained until more than 20 min. after the administration of physostigma.	*With atropia*, none. *After physostigma*, in 2 hours, wet fæcal pellets were passed. No salivation nor increase of the secretion of any buccal gland occurred, excepting that during a few minutes after the administration of physostigma movements were made of the mouth and lips.	*With atropia*, none. *After physostigma*, in 8 min., slight paralysis; and in 10 min., decided paralysis, which increased until 50 min. Soon after the paralysis diminished, and it had almost disappeared in 3 hours. Tremors and weak spasms frequently occurred, and fibrillary twitches were very well marked during the greater part of the experiment.
	b	4 lbs. 3 oz.	0	0	2·1 (= 1·5 gr. p. 3 lbs.)	Death, in 15 min.	—	—	—	—	—
123.	*a*	2 lbs. 15 oz. [Experiment *b* was performed nine days after experiment *a*.]	0·025	0·028	3·	Recovery.	*With atropia*, in 3 min., dilatation from $\frac{13}{15} \times \frac{13}{15}$ to $\frac{15}{15} \times \frac{15}{15}$. *After physostigma*, in 2 min., further dilatation to $\frac{17}{15} \times \frac{17}{15}$; and then, in 1 hour, contraction to $\frac{15}{15} \times \frac{15}{15}$.	*With atropia*, in 4 min., acceleration from 39 to 47 per 10 sec. *After physostigma*, in 1 hour, slowing to the rate per 10 sec. of 44; and in 2 hours, to that of 37. This reduced rate continued for more than 5 days.	*With atropia*, none. *After physostigma*, slowing occurred from the original rate of 18 per 10 sec. in 1 hour to 15; and this rate continued for more than 2 hours afterwards.	*With atropia*, none. *After physostigma*, none, excepting a slight increase in the secretions of the buccal glands for a few minutes after physostigma had been injected. There was no defæcation nor urination during the 3 hours of continuous observation.	*With atropia*, none. *After physostigma*, in 10 min., decided paralysis, which became very great, and was still marked, though diminished, in 3 hours, after which the observations were stopped. Tremors and weak spasms occurred pretty frequently, and fibrillary twitches were well developed.
	b	3 lbs.	0	0	1·2	Death, in 12 min.	—	—	—	—	—

Number of Experiment.	Weight of Rabbit.	Doses of Sulphate of Atropia (in Grains). Actual Dose.	Doses of Sulphate of Atropia (in Grains). Dose p. 3 lbs. of Animal.	Dose of Physostigma (in Grains). Actual Dose of Extract.	Result.	Effect on the Pupils. (The Measurements are in fiftieths of an inch.)	Effect on the Heart.	Effect on the Respirations.	Effect on Secretion and Excretion.	Effects on Motility, &c.
124. *a* [Experiment *b* was performed nine days after experiment *a*.]	3 lbs. 4 oz.	0·0375	0·034	3·25	Recovery.	*With atropia*, in 3 min. 30 sec., dilatation from $\frac{1}{50} \times \frac{9}{50}$ to $\frac{13}{50} \times \frac{13}{50}$. *After physostigma*, in 2 min., further dilatation to $\frac{14}{50} \times \frac{16}{50}$; in 20 min., contraction to $\frac{15}{50} \times \frac{15}{50}$; and in 1 hour 40 min., to $\frac{14}{50} \times \frac{14}{50}$.—On the following day, the size was $\frac{24}{50} \times \frac{11}{50}$; and on the 3d day, $\frac{10}{50} \times \frac{9}{50}$.	*With atropia*, in 4 min. 30 sec., acceleration from 37 to 46 per 10 sec. *After physostigma*, no observation could be made until 56 min., when the rate per 10 sec. was 38, and this rate was continued for more than 1 hour.—On the following day, the rate per 10 sec. was 35; on the 3d day, 39.	*With atropia*, none. *After physostigma*, no accurate observations could be made on account of the twitches and tremors, during the period of continuous observation.	*With atropia*, none. *After physostigma*, none during the 2 hours of continuous observation.	*With atropia*, none. *After physostigma*, in 8 min., slight paralysis; and in 25 min., severe paralysis, which, though diminished, had not disappeared in 2 hours. Tremors and weak spasms frequently occurred, and fibrillary twitches were well developed.
b	3 lbs. 4 oz.	0	0	1·3 (= 1·2 gr. p. 3 lbs.	Death, in 19 min.	—	—	—	—	—
125. *a* [Experiment *b* was performed seven days after experiment *a*.]	3 lbs.	0·0375	0·0375	3·	Recovery.	*With atropia*, none noted. *After physostigma*, in 4 min., dilatation from the original size of $\frac{13}{50} \times \frac{14}{50}$ to $\frac{17}{50} \times \frac{17}{50}$. The latter size remained until 1 hour 15 min. Subsequently, a little contraction occurred; and in 1 hour 45 min., the size was $\frac{15}{50} \times \frac{15}{50}$.—On the following day, the size was $\frac{15}{50} \times \frac{15}{50}$; and on the 3d day, $\frac{13}{50} \times \frac{13}{50}$.	*With atropia*, none noted. *After physostigma*, the rate per 10 sec. could not be ascertained on account of tremors and twitches.—On the following day, it was 34 per 10 sec.; and on the 3d day, 37.	*With atropia*, none. *After physostigma*, none noted.	*With atropia*, none. *After physostigma*, in 45 min., a small quantity of urine was voided almost *guttatim*; and in 59 min. a further quantity freely. No salivation occurred, nor was there any evidence of an increase in the secretion of any gland.	*With atropia*, none. *After physostigma*, in 9 min., slight paralysis; in 27 min., pretty decided paralysis; and in 1 hour 45 min., only a little weakness. Tremors and weak spasms frequently occurred, and fibrillary twitches were present in a prominent form until after 2 hours.
b	3 lbs.	0	0	1·5	Death, in 21 min.	—	—	—	—	—
126. *a* [Experiment *b* was performed seven days after experiment *a*.]	3 lbs.	0·05	0·05	3·	Recovery.	*With atropia*, in 4 min., dilatation from $\frac{13}{50} \times \frac{14}{50}$ to $\frac{17}{50} \times \frac{17}{50}$. *After physostigma*, in 5 min., further dilatation to $\frac{17}{50} \times \frac{17}{50}$; and in 1 hour 10 min., slight contraction to $\frac{15}{50} \times \frac{15}{50}$.—On the following day, the size was $\frac{16}{50} \times \frac{16}{50}$; and on the 4th day, $\frac{14}{50} \times \frac{13}{50}$.	*With atropia*, none noted. *After physostigma*, no accurate observation was possible.—On the following day, the rate per 10 sec. was 29; and on the 3d day, 40.	*With atropia*, none noted. *After physostigma*, none noted.	*With atropia*, none. *After physostigma*, in 13 min., the occurrence of moist laryngeal sounds with respiration indicated some increase of secretion, and these sounds occurred several times. There was no salivation nor defæcation; but in 1 hour a small quantity of urine was voided almost *guttatim*; and in 1 hour 10 min., in a copious stream.	*With atropia*, none. *After physostigma*, in 7 min., slight paralysis; in 20 min., very decided paralysis; and in 2 hours, slight paralysis. Tremors frequently occurred, and slight feeble spasms occasionally. Fibrillary twitches was present in a prominent form during at least 2 hours.
b	3 lbs.	0	0	1·2	Death, in 27 min.	—	—	—	—	—

Number of Experiment.	Weight of Rabbit.	Doses of Sulphate of Atropia (in Grains). Actual Dose.	Doses of Sulphate of Atropia (in Grains). Dose p. 3 lbs. of Animal	Dose of Physostigma (in Grains). Actual Dose of Extract.	Result.	Effect on the Pupils. (The Measurements are in fiftieths of an inch.)	Effect on the Heart.	Effect on the Respirations.	Effect on Secretion and Excretion.	Effects on Motility, &c.
127. *a*	3 lbs. 6 oz. [Experiment *b* was performed eight days after experiment *a*.]	0·1	0·088	3·4	Recovery.	*With atropia*, in 3 min. 30 sec., dilatation from $\frac{15}{50} \times \frac{15}{50}$ to $\frac{16}{50} \times \frac{16}{50}$. *After physostigma*, in 2 min., further dilatation to $\frac{15}{50} \times \frac{15}{50}$; and in 1 hour 20 min., contraction to $\frac{17}{50} \times \frac{17}{50}$.—On the 8th day the size was still $\frac{15}{50} \times \frac{15}{50}$.	*With atropia*, in 4 min. 30 sec., acceleration from 36 to 45 per 10 sec. *After physostigma*, in 1 hour, the rate per 10 sec. was 48; in 2 hours, 44; and in 2 hours 45 min., 48.—On the following day the rate per 10 sec. was 37.	*With atropia*, none. *After physostigma*, slowing from the original rate of 22 per 10 sec. took place; and in 2 min., the rate was 19, which in 1 hour, it was 12.	*With atropia*, none. *After physostigma*, none for at least 3 hours.	*With atropia*, none. *After physostigma*, in 10 min., slight paralysis; in 20 min., well-marked paralysis; and in 3 hours, decided though greatly diminished paralysis. Tremors frequently occurred, and fibrillary twitches were present in a well developed form.
b	3 lbs. 5 oz.	0	0	1·9 (= nearly 1·8 gr. p. 3 lbs.)	Death, in 16 min.	—	—	—	—	—
128. *a*	3 lbs. 7 oz. [Experiment *b* was performed eight days after experiment *a*.]	0·5	0·43	3·5	Recovery.	*With atropia*, in 4 min., dilatation from $\frac{14}{50} \times \frac{13}{50}$ to $\frac{16}{50} \times \frac{16}{50}$. *After physostigma*, in 4 min., further dilatation to $\frac{17}{50} \times \frac{17}{50}$. This size continued for 3 hours.—On the following day the size was $\frac{18}{50} \times \frac{18}{50}$; on the 4th day, $\frac{17}{50} \times \frac{17}{50}$; and on the 8th day, $\frac{14}{50} \times \frac{13}{50}$.	*With atropia*, in 4 min. 30 sec., acceleration from 39 to 48 per 10 sec. *After physostigma*, in 24 min., the rate per 10 sec. was 50; in 35 min., 48; and in 3 hours 10 min., 48.—On the following day it was 32; and on the 4th day, 40.	*With atropia*, none noted. *After physostigma*, none noted.	*With atropia*, none. *After physostigma*, none.	*With atropia*, none. *After physostigma*, in 10 min., slight weakness; in 40 min., pretty well-advanced paralysis; and in 2 hours 20 min., almost no paralysis. Spasms occurred in 2 hours 10 min., and were frequently repeated during the next hour and 30 min. Fibrillary twitches were pretty well-developed.
b	3 lbs. 8 oz.	0	0	1·7 (= about 1·5 gr. p. 3 lbs.)	Death, in 19 min.	—	—	—	—	—
129. *a*	3 lbs. 6 oz. [Experiment *b* was performed six days after experiment *a*.]	0·5	0·44	3·3	Recovery.	*With atropia*, in 2 min. 30 sec., dilatation from $\frac{15}{50} \times \frac{14}{50}$ to $\frac{17}{50} \times \frac{17}{50}$. *After physostigma*, the above size was maintained for 2 hours 50 min.—On the following day the size was $\frac{18}{50} \times \frac{18}{50}$; and on the 9th day, $\frac{16}{50} \times \frac{14}{50}$.	*With atropia*, in 4 min., acceleration from 37 to 45 per 10 sec. *After physostigma*, the rate could not be ascertained until 2 hours, when it was 46 per 10 sec.—On the following day it was 32 per 10 sec.	*With atropia*, none noted. *After physostigma*, slowing occurred. In 23 min. the rate per 10 sec. was 17; in 1 hour, 13; and in 1 hour 10 min., 12.	*With atropia*, in 3 min., several fæcal pellets were passed. *After physostigma*, none. Neither defæcation nor urination occurred, nor was the secretion of any gland increased.	*With atropia*, none. *After physostigma*, in 15 min., decided paralysis; in 1 hour, well-marked paralysis and general flaccidity; and in 2 hours, only very slight paralysis. Occasionally weak tremors occurred; and fibrillary twitches were but slightly developed.
b	3 lbs. 6 oz.	0	0	1·35 (= 1·2 gr. p. 3 lbs.)	Death, in 30 min.	—	—	—	—	—

Number of Experiment.	Weight of Rabbit.	Doses of Sulphate of Atropia (in Grains). Actual Dose.	Doses of Sulphate of Atropia (in Grains). Dose p. 3 lbs. of Animal.	Dose of Physostigma (in Grains). Actual Dose of Extract.	Result.	Effect on the Pupils. (The Measurements are in fiftieths of an inch.)	Effect on the Heart.	Effect on the Respirations.	Effect on Secretion and Excretion.	Effects on Motility, &c.
130. *a* [Experiment *b* was performed nine days after experiment *a*.]	3 lbs. 6 oz.	1·17	1·	3·4	Recovery.	*With atropia*, in 3 min., dilatation from $\frac{1\cdot0}{5\cdot0} \times \frac{9}{5\cdot0}$ to $\frac{1\cdot5}{5\cdot0} \times \frac{1\cdot5}{5\cdot0}$. *After physostigma*, in 2 min. 30 sec., further dilatation to $\frac{1\cdot6}{5\cdot0} \times \frac{1\cdot6}{5\cdot0}$. Afterwards contraction occurred, in 1 hour 7 min., to $\frac{1\cdot5}{5\cdot0} \times \frac{1\cdot5}{5\cdot0}$; and in 2 hours, to $\frac{1\cdot4}{5\cdot0} \times \frac{1\cdot4}{5\cdot0}$.—On the following day the size was $\frac{1\cdot4}{5\cdot0} \times \frac{1\cdot3}{5\cdot0}$; and on the 4th day, $\frac{1\cdot3}{5\cdot0} \times \frac{1\cdot2}{5\cdot0}$.	*With atropia*, in 3 min. 20 sec., acceleration from 34 to 42 per 10 sec. *After physostigma*, in 1 hour 6 min., slowing had occurred to 28 per 10 sec. In 2 hours 25 min. the rate per 10 sec. was 37.—On the following day it was 30; and on the 3d day, 38 per 10 sec.	*With atropia*, none noted. *After physostigma*, slowing occurred, from the original rate per 10 sec. of 19 to, in 1 hour 7 min., 14; and this rate continued for more than 1 hour.	*With atropia*, none. *After physostigma*, none, until 1 hour 5 min., when laryngeal sounds showed that the secretion of certain buccal glands was increased. These sounds, however, continued for only 8 min. In 1 hour 15 min., normal fæcal pellets were passed; and in 2 hours, some wet fæcal.	*With atropia*, none. *After physostigma*, in 15 min., distinct paralysis; in 19 min., decided paralysis; and in 2 hours 30 min., pretty well-marked, though diminished, paralysis. Tremors occasionally occurred; and fibrillary twitches were well developed at an early period, but they had almost disappeared in 2 hours.
	3 lbs. 7 oz.	0	0	1·7 (= 1·5 gr. p. 3 lbs.	Death, in 16 min.	—	—	—	—	—
131. *a* [Experiment *b* was performed ten days after experiment *a*.]	3 lbs. 12 oz.	1·5	1·2	3·7	Recovery.	*With atropia*, in 4 min., dilatation from $\frac{1\cdot5}{5\cdot0} \times \frac{1\cdot4}{5\cdot0}$ to $\frac{1\cdot8}{5\cdot0} \times \frac{1\cdot8}{5\cdot0}$. *After physostigma*, in 31 min., the size was $\frac{1\cdot8}{5\cdot0} \times \frac{1\cdot8}{5\cdot0}$; in 2 hours 10 min., $\frac{1\cdot7}{5\cdot0} \times \frac{1\cdot7}{5\cdot0}$; and in 4 hours, $\frac{1\cdot7}{5\cdot0} \times \frac{1\cdot7}{5\cdot0}$.—On the following day it was $\frac{2\cdot0}{5\cdot0} \times \frac{2\cdot0}{5\cdot0}$; and on the 11th day, $\frac{1\cdot4}{5\cdot0} \times \frac{1\cdot3}{5\cdot0}$.	*With atropia*, in 3 min. 50 sec., acceleration from 36 to 47 per 10 sec. *After physostigma*, in 4 min., the rate per 10 sec. was 48; in 19 min., 54; in 1 hour, 52; in 2 hours 20 min., 50; in 2 hours 50 min., 45; and in 4 hours, 50.—On the following day the rate per 10 sec. was 32.	*With atropia*, none noted. *After physostigma*, slowing occurred. In 31 min., the rate per 10 sec. was 17; in 41 min., 11; and in 2 hours, 12.	*With atropia*, none. *After physostigma*, none, until 3 hours 11 min., when slight mucous sounds accompanied the respirations during 10 min. or so. Neither defæcation nor urination occurred.	*With atropia*, none. *After physostigma*, in 13 min., slight paralysis; in 31 min., decided paralysis and some flaccidity; and in 4 hours, only slight weakness. Well-marked tremors frequently occurred. Fibrillary twitches were present in a slight form for about 1 hour, they then almost disappeared, but again became prominent in 2 hours 30 min.
	3 lbs. 13 oz.	0	0	1·5 (= 1·2 gr. p. 3 lbs.)	Death, in 34 min.	—	—	—	—	—
132. *a* [Experiment *b* was performed eight days after experiment *a*.]	4 lbs. 1 oz.	1·7	1·25	4·1	Recovery.	*With atropia*, in 4 min., dilatation from $\frac{1\cdot3}{5\cdot0} \times \frac{1\cdot3}{5\cdot0}$ to $\frac{1\cdot6}{5\cdot0} \times \frac{1\cdot6}{5\cdot0}$. *After physostigma*, the size remained about $\frac{1\cdot6}{5\cdot0} \times \frac{1\cdot6}{5\cdot0}$ for more than 2 hours.—On the following day the size was $\frac{1\cdot5}{5\cdot0} \times \frac{1\cdot5}{5\cdot0}$; and on the 4th day, $\frac{1\cdot5}{5\cdot0} \times \frac{1\cdot5}{5\cdot0}$.	*With atropia*, in 4 min. 30 sec., acceleration from 41 to 50 per 10 sec. *After physostigma*, in 27 min., the rate per 10 sec. was 55.—On the following day it was 36; and on the 4th day, 40.	*With atropia*, none noted. *After physostigma*, inconsiderable slowing took place.	*With atropia*, none. *After physostigma*, in 16 min., urine was freely voided. Neither defæcation occurred, nor was the secretion of any gland increased during the 2 hours of continuous observation.	*With atropia*, none. *After physostigma*, in 12 min., slight weakness; in 20 min., decided paralysis; and in 2 hours, pretty distinct paralysis. No tremors occurred, but several spasms, having an emprosthotonic character, appeared after 1 hour and 25 min. Fibrillary twitches were only slightly developed, and at the earlier part of the experiment.
	4 lbs. 2 oz.	0	0	1·65 (= 1·2 gr. p. 3 lbs.)	Death, in 28 min.	—	—	—	—	—

Number of Experiment.	Weight of Rabbit.	Doses of Sulphate of Atropia (in Grains). Actual Dose.	Doses of Sulphate of Atropia (in Grains). Dose p. 3 lbs. of Animal.	Dose of Physostigma (in Grains). Actual Dose of Extract.	Result.	Effect on the Pupils. (The Measurements are in fiftieths of an inch.)	Effect on the Heart.	Effect on the Respirations.	Effect on Secretion and Excretion.	Effects on Motility, &c.
133. *a*	3 lbs. 2 oz. [Experiment *b* was performed ten days after experiment *a*.]	1·7	1·63	3·4	Recovery.	*With atropia*, in 4 min., dilatation from $\frac{12}{50} \times \frac{11}{50}$ to $\frac{16}{50} \times \frac{16}{50}$. *After physostigma*, in 1 hour, the size had become $\frac{18}{50} \times \frac{18}{50}$.	*With atropia*, in 4 min. 20 sec., acceleration from 38 to 49 per 10 sec. *After physostigma*, in 5 min., the rate per 10 sec. was 52; in 20 min., it was 57; in 1 hour, 54; and in 3 hours 30 min., 45.	*With atropia*, none. *After physostigma*, slowing occurred from the original rate per 10 sec. of 16 to, in 30 min., 14; in 1 hour, 13; and in 3 hours 30 min., also 13. A slightly accelerated rate, however, preceded this slowing.	*With atropia*, none. *After physostigma*, none. Neither defæcation nor urination occurred, nor was there any evidence of increase in the secretion of the buccal or other glands during the 3 hours and 30 min. of continuous observation.	*With atropia*, none. *After physostigma*, in 11 min., slight weakness of anterior extremities; in 18 min., well-marked general paralysis and flaccidity; and in 3 hours 30 min., only a little weakness. Feeble tremors and spasms occasionally occurred; and fibrillary twitches were present in a slight form.
b	3 lbs. 2 oz.	0	0	1·25 (= 1·2 gr. p. 3 lbs.)	Death, in 26 min.	—	—	—	—	—
134. *a*	3 lbs. [Experiment *b* was performed ten days after experiment *a*.]	2·	2·	3·	Recovery.	*With atropia*, in 3 min., dilatation from $\frac{11}{50} \times \frac{10}{50}$ to $\frac{15}{50} \times \frac{15}{50}$. *After physostigma*, in 2 min., further dilatation to $\frac{16}{50} \times \frac{16}{50}$; and in 8 min., to $\frac{17}{50} \times \frac{17}{50}$. Contraction afterwards occurred, and in 1 hour 15 min., the size was $\frac{14}{50} \times \frac{14}{50}$.—On the following day, it was $\frac{17}{50} \times \frac{17}{50}$; and on the 4th day, $\frac{14}{50} \times \frac{13}{50}$.	*With atropia*, in 4 min. 30 sec., acceleration from 40 to 53 per 10 sec. *After physostigma*, no observations were made until the following day, when the rate per 10 sec. was 40; but the impulse was weak.	*With atropia*, none noted. *After physostigma*, slowing occurred. In 1 hour 30 min., the rate per 10 sec. was 16; in 1 hour 47 min., 12; in 1 hour 55 min., 10; in 2 hours, 9; and in 2 hours 10 min., 13.	*With atropia*, none. *After physostigma*, in 1 hour 15 min., several normal fæcal pellets were passed; and in 1 hour 22 min., urine was freely voided. No increase occurred in the secretion of any buccal gland.	*With atropia*, none. *After physostigma*, in 11 min., slight weakness; in 20 min., decided paralysis, soon followed by general flaccidity; and in 1 hour 30 min., only very slight weakness. Feeble tremors occurred occasionally, and fibrillary twitches were present during the earlier part of the experiment.
b	3 lbs. ½ oz.	0	0	1·2	Death, in 22 min.	—	—	—	—	—
135.	3 lbs.	2·	2·	3·	Death, in 52 min. after the administration of physostigma.	*With atropia*, in 3 min. 30 sec., dilatation from $\frac{13}{50} \times \frac{10}{50}$ to $\frac{15}{50} \times \frac{15}{50}$. *After physostigma*, in 1 min. 30 sec., further dilatation to $\frac{18}{50} \times \frac{18}{50}$; and this size continued until death. — After death, in 8 min., the size was $\frac{13}{50} \times \frac{13}{50}$.	*With atropia*, in 4 min. 30 sec., acceleration from 39 to 50 per 10 sec. *After physostigma*, in 4 min., further acceleration to 58 per 10 sec.; then slowing, in 18 min., to 40 per 10 sec., which rate was continued until 46 min.; and afterwards gradual slowing until death, the rate per 10 sec. being in 49 min., 34, and in 51 min., 15.	*With atropia*, none. *After physostigma*, slight acceleration followed by slowing. The rate per 10 sec. was in 34 min., 16; in 37 min., 14; in 42 min., 12; in 44 min., 6; in 48 min., 4; and afterwards only rare gasps occurred until death.	*With atropia*, none. *After physostigma*, none.	*With atropia*, none. *After physostigma*, in 11 min., distinct paralysis; in 20 min., very decided paralysis; and in 26 min., general flaccidity. Very feeble tremors occasionally occurred, and fibrillary twitches were but slightly developed.

Number of Experiment.	Weight of Rabbit.	Doses of Sulphate of Atropia (in Grains). Actual Dose.	Doses of Sulphate of Atropia (in Grains). Dose p. 3 lbs. of Animal.	Dose of Physostigma (in Grains). Actual Dose of Extract.	Result.	Effect on the Pupils. (The Measurements are in fiftieths of an inch.)	Effect on the Heart.	Effect on the Respirations.	Effect on Secretion and Excretion.	Effects on Motility, &c.
136.* *a* [Experiment *b* was performed fourteen days after experiment *a*.—The animal was a common wild rabbit.	3 lbs.	2·2	2·2	3	Recovery.	*With atropia*, dilatation occurred. *After physostigma*, dilatation remained for more than 2 hours 30 min.	*With atropia*, acceleration took place. *After physostigma*, further acceleration took place, and then slight slowing. In 32 min., the rate per 10 sec. was 52; and in 2 hours 30 min., 49. The impulse was weaker at the latter than at the former time.	*With atropia*, none noted. *After physostigma*, slight acceleration followed by slowing. In 32 min., the rate per 10 sec. was 24; in 41 min., 15; and in 2 hours 30 min., 11.	*With atropia*, none. *After physostigma*, none.	*With atropia*, none. *After physostigma*, in 11 min., decided paralysis; in 32 min., considerable general flaccidity; and in 2 hours 30 min., distinct though less complete paralysis. Rarely some feeble tremors occurred. Fibrillary twitches were only slightly developed.
	b 3 lbs. 1 oz.	0	0	3	Death, in 12 min.	—	—	—	—	—
137.	2lbs. 15½ oz.	2·27	2·3	2·93	Death, in 31 min. after the administration of physostigma.	*With atropia*, in 3 min., dilatation from $\frac{13}{50} \times \frac{12}{50}$ to $\frac{15}{50} \times \frac{14}{50}$. *After physostigma*, in 3 min., further dilatation to $\frac{17}{50} \times \frac{17}{50}$; in 9 min., slight contraction to $\frac{16}{50} \times \frac{16}{50}$; and the latter size was maintained until death.—After death the size was in 1 min., $\frac{18}{50} \times \frac{16}{50}$; in 4 min., $\frac{14}{50} \times \frac{14}{50}$; in 16 min., $\frac{13}{50} \times \frac{13}{50}$; and in 25 min., $\frac{9}{50} \times \frac{9}{50}$.	*With atropia*, in 4 min., acceleration from 35 to 47 per 10 sec. *After physostigma*, the rate was not counted.	*With atropia*, in 4 min. 20 sec., acceleration from 9 to 13 per 10 sec.. *After physostigma*, further acceleration occurred, and then slowing until death.	*With atropia*, none. *After physostigma*, none.	*With atropia*, none. *After physostigma*, in 6 min., slight paralysis; in 22 min., decided paralysis; and in 30 min., general flaccidity, accompanied with occasional tremors and even feeble general spasms. Fibrillary twitches were pretty well developed.
138.	3 lbs.	2·6	2·6	3	Death, in 18 min. after the administration of physostigma.	*With atropia*, in 4 min. 30 sec., dilatation from $\frac{14}{50} \times \frac{14}{50}$ to $\frac{18}{50} \times \frac{18}{50}$. *After physostigma*, in 13 min., further dilatation to $\frac{19}{50} \times \frac{18}{50}$; and in 17 min., to $\frac{20}{50} \times \frac{20}{50}$.—At death, the size was $\frac{20}{50} \times \frac{20}{50}$; and 3 min. afterwards it was $\frac{11}{50} \times \frac{11}{50}$.	*With atropia*, in 3 min. 30 sec., acceleration from 40 to 56 per 10 sec. *After physostigma*, in 11 min., further acceleration to 60 per 10 sec. Gradual slowing then occurred; and at 1 min. before death the rate per 10 sec. was 22.	*With atropia*, none. *After physostigma*, the rate per 10 sec. was in 5 min., 20; in 8 min., 19; in 13 min., 10; and 1 min. before death, only 2 gasps occurred per 30 sec.	*With atropia*, none. *After physostigma*, in 12 min., a few drops of urine were voided. No other effect was produced.	*With atropia*, none. *After physostigma*, in 9 min., decided paralysis; and in 13 min., general flaccidity, accompanied with feeble tremors and spasms. Fibrillary twitches were pretty well developed. —The first appearance of rigor was at 1 hour and 10 min. after death (temp. of laboratory, 56° F.).
139.	3 lbs. 6 oz.	3	2·66	3·4	Death, in 33 min. after the administration of physostigma.	*With atropia*, in 4 min., dilatation from $\frac{13}{50} \times \frac{11}{50}$ to $\frac{15}{50} \times \frac{14}{50}$. *After physostigma*, in 3 min., further dilatation to $\frac{16}{50} \times \frac{15}{50}$, which size remained until death. —After death, the size was in 3 min., $\frac{14}{50} \times \frac{13}{50}$; in 17 min., $\frac{11}{50} \times \frac{10}{50}$; and in 40 min., $\frac{10}{50} \times \frac{9}{50}$.	*With atropia*, in 4 min. 30 sec., acceleration from 38 to 47 per 10 sec. *After physostigma*, the rate per 10 sec. was in 15 min., 53; and in 28 min., 31.	*With atropia*, none. *After physostigma*, the rate per 10 sec., was in 14 min, 13; in 17 min., 12; in 20 min., 8; and in 23 min., only feeble gasps occurred very infrequently.	*With atropia*, none. *After physostigma*, none.	*With atropia*, none. *After physostigma*, in 9 min., decided paralysis; and in 15 min., general flaccidity. Several feeble tremors occurred shortly before death. Fibrillary twitches were but slightly developed.—There was no appearance of rigor at 2 hours 30 min. after death (temp. of laboratory, 56° F.).

* This animal was a common wild rabbit.

TABLE 6.—Experiments with Three times the Minimum-Lethal Dose of Physostigma (3·6 *grs. of Extract of Physostigma per Three Pounds Weight of Rabbit*).

Number of Experiment.	Weight of Rabbit	Doses of Sulphate of Atropia (in Grains). Actual Dose.	Doses of Sulphate of Atropia (in Grains). Dose p. 3 lbs. of Animal	Dose of Physostigma (in Grains). Actual Dose of Extract.	Result.	Effect on the Pupils. (The Measurements are in fiftieths of an inch.)	Effect on the Heart.	Effect on the Respirations.	Effect on Secretion and Excretion.	Effects on Motility, &c.
140.	3 lbs. 7 oz.	0·05	0·043	4·1	Death, in 35 min. after the administration of physostigma.	*With atropia*, in 4 min., dilatation from $\frac{11}{50} \times \frac{10}{50}$ to $\frac{14}{50} \times \frac{14}{50}$. *After physostigma*, in 2 min., further dilatation to $\frac{16}{50} \times \frac{16}{50}$; and in 10 min., to $\frac{18}{50} \times \frac{18}{50}$. Contraction then occurred, in 25 min. to $\frac{9}{50} \times \frac{8}{50}$; and afterwards there was slight dilatation.	*With atropia*, in 3 min. 30 sec., acceleration from 39 to 51 per 10 sec. *After physostigma*, further acceleration took place, and in 2 min. 30 sec., the rate per 10 sec. was 56. Slight slowing afterwards occurred, and in 26 min., the rate per 10 sec. was 48.	*With atropia*, none noted. *After physostigma*, acceleration from the original rate per 10 sec. of 17 took place, and in 3 min. the rate was 24. Slowing afterwards set in. In 25 min. the rate per 10 sec. was 7; and in 30 min., only infrequent and feeble gasps occurred until death.	*With atropia*, none. *After physostigma*, in 21 min., several normal fæcal pellets were passed. No urination occurred; and a slight and only temporary increase took place in the secretion of certain buccal glands, shown by movements of the lips soon after physostigma was injected.	*With atropia*, none. *With physostigma*, in 7 min., decided paralysis; and in 20 min., general flaccidity, which continued, accompanied with gentle tremors, until death. Fibrillary twitches were pretty well developed.
141.	3 lbs.	0·05	0·05	3·6	Death, in 53 min. after the administration of physostigma.	*With atropia*, in 4 min., dilatation from $\frac{14}{50} \times \frac{13}{50}$ to $\frac{17}{50} \times \frac{17}{50}$. *After physostigma*, in 4 min., further dilatation to $\frac{18}{50} \times \frac{18}{50}$, and this size remained until death.—After death, in 3 min., the size was $\frac{15}{50} \times \frac{14}{50}$.	*With atropia*, in 3 min. 30 sec., acceleration from 40 to 51 per 10 sec. *After physostigma*, the acceleration was maintained until 22 min. In 34 min., the rate per 10 sec. was 28.	*With atropia*, none noted. *After physostigma*, slight acceleration occurred, and was followed by slowing. In 20 min., the rate per 10 sec. was 11; in 33 min., 7; and afterwards only infrequent and irregular gasps occurred until death.	*With atropia*, none. *After physostigma*, no increase of any secretion or excretion occurred.	*With atropia*, none. *After physostigma*, in 7 min., slight paralysis; and in 10 min., general flaccidity, which continued, accompanied with feeble tremors, until death. Fibrillary twitches were well developed.
142. *a* [Experiment *b* was performed eleven days after experiment *a*.]	3 lbs.	0·06	0·06	3·6	Recovery.	*With atropia*, in 4 min., dilatation from $\frac{14}{50} \times \frac{15}{50}$ to $\frac{15}{50} \times \frac{15}{50}$. *After physostigma*, the size was, in 6 min., $\frac{17}{50} \times \frac{17}{50}$; and in 2 hours 30 min., $\frac{16}{50} \times \frac{16}{50}$.—On the following day it was $\frac{15}{50} \times \frac{15}{50}$.	*With atropia*, in 4 min. 30 sec., acceleration from 36 to 45 per 10 sec. *After physostigma*, this rate per 10 sec. was, in 5 min., 34; in 22 min., 41; in 1 hour 15 min., 36; and in 2 hours 5 min., 32.—On the following day it was 29.	*With atropia*, none. The original rate was 17 per 10 sec. *After physostigma*, the rate per 10 sec. was, in 7 min., 15; in 22 min., 16; in 1 hour 16 min., 13; and in 2 hours 31 min., 19.—On the following day it was 13.	*With atropia*, none. *After physostigma*, in 7 min., slight increase in the secretion of certain buccal glands, which soon ceased. In 3 hours 3 min., urine was voided. There was no defæcation nor salivation during the 3 hours and 15 min. of continuous observation.	*With atropia*, none. *After physostigma*, in 2 min., infrequent fibrillary twitches, which soon became very well marked, and continued so for more than 3 hours. In 12 min., slight paralysis; in 25 min., very decided paralysis; and in 2 hours 30 min., only slight paralysis. Occasionally tremors occurred.
	b 3 lbs. 1 oz.	0	0	1·2	Death, in 20 min.	—	—	—	—	—

Number of Experiment.	Weight of Rabbit.	Doses of Sulphate of Atropia (in Grains). Actual Dose.	Doses of Sulphate of Atropia (in Grains). Dose p. 3 lbs. of Animal.	Dose of Physostigma (in Grains). Actual Dose of Extract.	Result.	Effect on the Pupils. (The Measurements are in fiftieths of an inch.)	Effect on the Heart.	Effect on the Respirations.	Effect on Secretion and Excretion.	Effects on Motility, &c.
143. *a* [Experiment *b* was performed nine days after experiment *a*.]	2 lbs. 15 oz.	0·075	0·076	3·52	Recovery.	*With atropia*, in 3 min., dilatation from $\frac{14}{50} \times \frac{14}{50}$ to $\frac{14}{50} \times \frac{14}{50}$. *After physostigma*, in 43 min., further dilatation to $\frac{16}{50} \times \frac{16}{50}$.—On the following day, the size was $\frac{12}{50} \times \frac{11}{50}$.	*With atropia*, in 2 min. 30 sec., acceleration from 37 to 50 per 10 sec. *After physostigma*, in 43 min., the rate per 10 sec. was 52; and in 1 hour 40 min., 48.—On the following day, the rate per 10 sec. was 40.	*With atropia*, none noted. *After physostigma*, slowing took place from the original rate per 10 sec. of 28, to, in 43 min., 21; and no further slowing had occurred within 1 hour 50 min.	*With atropia*, none. *After physostigma*, none.	*With atropia*, none. *After physostigma*, in 8 min., slight paralysis; and in 53 min., well-marked paralysis: but flaccidity did not set in. Fibrillary twitches were well developed.
b	2 lbs. 15 oz.	0	0	1·17 (= 1·2 gr. p. 3 lbs.)	Death, in 24 min. 30 sec.	—	—	—	—	—
144. *a* [Experiment *b* was performed seven days after experiment *a*.]	3 lbs. 5¾ oz.	0·1	0·088	4·	Recovery.	*With atropia*, in 3 min. 30 sec., dilatation from $\frac{14}{50} \times \frac{13}{50}$ to $\frac{17}{50} \times \frac{17}{50}$. *After physostigma*, in 1 hour, contraction had occurred to $\frac{14}{50} \times \frac{14}{50}$, and this size continued until after 1 hour 30 min.—On the following day, the size was $\frac{17}{50} \times \frac{17}{50}$; and on the 3d day $\frac{16}{50} \times \frac{16}{50}$.	*With atropia*, in 4 min. 30 sec., acceleration from 42 to 60 per 10 sec. *After physostigma*, the rate per 10 sec. was, in 45 min., 57; in 1 hour, 34; and in 1 hour 30 min., 29.—On the following day, the rate per 10 sec. was 52; and on the 3d day, 45.	*With atropia*, none noted. *After physostigma*, the rate per 10 sec. was, in 34 min., 16; in 1 hour, 12; and in 1 hour 25 min., 13.	*With atropia*, none. *After physostigma*, in 1 hour, slight salivation occurred, and continued for about 16 min. In 1 hour 20 min., several normal fæcal pellets were found. No urination occurred all this time.	*With atropia*, none. *After physostigma*, in 5 min., slight paralysis; in 25 min., general flaccidity; and in 1 hour 30 min., well-marked, though greatly diminished paralysis. Tremors frequently occurred, and several times there were weak spasms of an emprosthotonic character. Fibrillary twitches were pretty well developed, but only during the earlier part of the experiment.
b	3 lbs. 4 oz.	0	0	1·3 (= 1·2 gr. p. 3 lbs.)	Death, in 28 min.	—	—	—	—	—
42.* *a* [Experiment *b* was performed eight days after experiment *a*.]	3 lbs. 4 oz.	0·17	0·16	3·9	Recovery.	*With atropia*, in 4 min., dilatation from $\frac{14}{50} \times \frac{13}{50}$ to $\frac{16}{50} \times \frac{16}{50}$. *After physostigma*, in 3 min. 10 sec., further dilatation to $\frac{18}{50} \times \frac{18}{50}$; then, in 2 hours 30 sec., slight contraction to $\frac{17}{50} \times \frac{17}{50}$.—On the following day, the size was $\frac{17}{50} \times \frac{17}{50}$; and on the 5th day, $\frac{14}{50} \times \frac{13}{50}$.	*With atropia*, in 4 min. 10 sec., acceleration from 42 to 54 per 10 sec. *After physostigma*, the rate per 10 sec. was, in 5 min., 60; in 40 min., 57; in 2 hours 30 sec., 47; and in 6 hours 30 min., 31.—On the following day, the rate per 10 sec. was 27; and on the 5th day, 40.	*With atropia*, in 4 min. 30 sec., slowing from 26 to 18 per 10 sec. *After physostigma*, the rate per 10 sec. was, in 15 min., 19; in 40 min., 13; in 50 min., 11; in 2 hours, 12; and in 6 hours 30 min., about 24.	*With atropia*, none. *After physostigma*, in 6 hours 30 min., normal fæcal pellets were passed; but no urine had been voided, nor had any increase occurred in the secretion of the buccal glands.	*With atropia*, none. *After physostigma*, in 10 min., slight weakness; in 15 min., decided paralysis; and in 6 hours 30 min., almost no paralysis. Slight tremors occurred; and fibrillary twitches were well developed during the earlier part of the experiment.
b	3 lbs. 5 oz.	0	0	1·3	Death in 31 min.	—	—	—	—	—

* A full description of this experiment has already been given in Section A (see p. 546).

Number of Experiment.	Weight of Rabbit.	Doses of Sulphate of Atropia (in Grains). Actual Dose.	Doses of Sulphate of Atropia (in Grains). Dose p. 3 lbs. of Animal.	Dose of Physostigma (in Grains). Actual Dose of Extract.	Result.	Effect on the Pupils. (The Measurements are in fiftieths of an inch.)	Effect on the Heart.	Effect on the Respirations.	Effect on Secretion and Excretion.	Effects on Motility, &c.
145. *a*	3 lbs. [Experiment *b* was performed fifteen days after experiment *a*.]	0·5	0·5	3·6	Recovery.	*With atropia*, in 4 min., dilatation from $\frac{12}{50} \times \frac{11}{50}$ to $\frac{18}{50} \times \frac{18}{50}$. *After physostigma*, in 23 min., further dilatation to $\frac{18}{50} \times \frac{18}{50}$; then, in 1 hour, contraction to $\frac{17}{50} \times \frac{17}{50}$; and in 2 hours, to $\frac{16}{50} \times \frac{16}{50}$.—On the following day, the size was $\frac{18}{50} \times \frac{18}{50}$; on the 3d day, $\frac{12}{50} \times \frac{12}{50}$; and on the 16th day, $\frac{14}{50} \times \frac{13}{50}$.	*With atropia*, in 3 min. 30 sec., acceleration from 41 to 56 per 10 sec. *After physostigma*, the rate per 10 sec. was, in 7 min., 61; in 21 min., 56; and in 2 hours, 56.—On the following day, it was 38; and on the 3d day, 34.	*With atropia*, in 4 min. 30 sec., acceleration from 22 to 26 per 10 sec. *After physostigma*, the rate per 10 sec. was, in 41 min., 21; in 1 hour, 21; and in 2 hours, 19.	*With atropia*, none. *After physostigma*, none. Neither defæcation nor urination occurred, nor was the secretion of any buccal gland increased during the 3 hours of continuous observation.	*With atropia*, none. *After physostigma*, in 10 min., decided paralysis; in 22 min., general flaccidity; and in 2 hours, only a little weakness. Tremors and very weak spasms frequently occurred, until 2 hours; but fibrillary twitches continued in a well-marked form for more than 3 hours.
b	3 lbs.	0	0	1·2	Death in 27 min.	—	—	—	—	—
146. *a*	3 lbs. [Experiment *b* was performed forty-one days after experiment *a*; and this rabbit was also used, twenty-one days after experiment 146 *a*, in experiment 108 *a*.]	1	1	3·6	Recovery.	*With atropia*, in 3 min. 30 sec., dilatation from $\frac{14}{50} \times \frac{13}{50}$ to $\frac{17}{50} \times \frac{17}{50}$. *After physostigma*, in 2 min., further dilatation to $\frac{18}{50} \times \frac{18}{50}$. No obvious contraction took place for at least 1 hour 40 min.—On the following day, the size was $\frac{18}{50} \times \frac{18}{50}$.	*With atropia*, in 4 min., acceleration from 39 to 51 per 10 sec. *After physostigma*, the rate per 10 sec. was, in 3 min., 52; in 12 min., 57; in 50 min., 56; in 58 min., 46; in 1 hour 3 min., 39; and in 1 hour 40 min., 38.—On the following day, the rate per 10 sec. was 29.	*With atropia*, in 3 min., slowing from 32 to 25 per 10 sec. *After physostigma*, the rate per 10 sec. was, in 3 min. 30 sec., 27; in 50 min., 18; in 1 hour 2 min., 12; and in 2 hours, 11.	*With atropia*, none. *After physostigma*, none. Neither defæcation nor urination occurred, nor was the secretion of any buccal gland increased during the 2 hours of continuous observation.	*With atropia*, none. *After physostigma*, in 9 min., distinct paralysis; and in 30 min., general flaccidity, which was still present in 2 hours. Gentle tremors occasionally took place, and fibrillary twitches were slightly developed, but they occurred only at the earlier part of the experiment.
b	3 lbs.	0	0	1·2	Death, in 14 min.	—	—	—	—	—
147. *a*	3 lbs. [Experiment *b* was performed nine days after experiment *a*.]	1·2	1·2	3·6	Recovery.	*With atropia*, in 2 min. 30 sec., dilatation from $\frac{13}{50} \times \frac{13}{50}$ to $\frac{18}{50} \times \frac{18}{50}$. *After physostigma*, in 2 min., further dilatation to $\frac{18}{50} \times \frac{18}{50}$; and in 1 hour 30 min., contraction to $\frac{14}{50} \times \frac{14}{50}$, which size remained until after 2 hours 40 min.—On the following day, the size was $\frac{14}{50} \times \frac{14}{50}$.	*With atropia*, in 4 min. 30 sec., acceleration from 36 to 52 per 10 sec. *After physostigma*, the rate per 10 sec. was, in 3 min., 56; and in 1 hour 12 min., 36.—On the following day, the rate per 10 sec. was 35.	*With atropia*, in 3 min., slowing from 19 to 15 per 10 sec. *After physostigma*, the rate per 10 sec. was, in 22 min., 14; and in 40 min., 13.	*With atropia*, none. *After physostigma*, in 18 min., urine was freely voided; and in 1 hour 10 min., several normal fæcal pellets were passed. No increase occurred in the secretion of any buccal gland, until 1 hour 25 min., when a very little salivation occurred.	*With atropia*, none. *After physostigma*, in 10 min., slight paralysis; in 30 min., general flaccidity; and in 2 hours 20 min., slight paralysis. Tremors now and then occurred. Fibrillary twitches were present in a pretty well-marked form until at least 2 hours 20 min.
b	3 lbs. 2 oz.	0	0	1·25 (= 1·2 gr. p. 3 lbs.)	Death, in 25 min.	—	—	—	—	—

Number of Experiment.	Weight of Rabbit.	Doses of Sulphate of Atropia (in Grains). Actual Dose.	Doses of Sulphate of Atropia (in Grains). Dose p. 3 lbs. of Animal.	Dose of Physostigma (in Grains). Actual Dose of Extract.	Result.	Effect on the Pupils. (The Measurements are in fiftieths of an inch.)	Effect on the Heart.	Effect on the Respirations.	Effect on Secretion and Excretion.	Effects on Motility, &c.
148.	3 lbs.	1·3	1·3	3·6	Death, in 1 hour 13 min., after the administration of physostigma.	*With atropia*, in 3 min., dilatation from $\frac{11}{50} \times \frac{10}{50}$ to $\frac{17}{50} \times \frac{17}{50}$. *After physostigma*, the size was in 2 min. $\frac{17}{50} \times \frac{17}{50}$; in 31 min., $\frac{16}{50} \times \frac{15}{50}$; in 48 min., $\frac{13}{50} \times \frac{12}{50}$; and in 1 hour 6 min., $\frac{14}{50} \times \frac{14}{50}$.—After death, the size was in 1 min. $\frac{11}{50} \times \frac{12}{50}$.	*With atropia*, in 4 min., acceleration from 45 to 54 per 10 sec. *After physostigma*, the rate per 10 sec. was, in 20 min., 60; in 35 min., 58; and in 45 min., 48.	*With atropia*, none. *After physostigma*, the rate per 10 sec. was, in 10 min., 22; in 15 min., 17; in 45 min., 9; and in 58 min., 4. Afterwards, rare gasps occurred irregularly until death.	*With atropia*, none. *After physostigma*, none. During the experiment, neither defæcation nor urination occurred, nor was the secretion of any buccal gland increased.	*With atropia*, none. *After physostigma*, in 6 min., distinct paralysis; and in 10 min., general flaccidity, which continued until death. Tremors and weak spasms frequently occurred. Fibrillary twitches were well marked during the first 28 min., but they afterwards diminished, and had almost disappeared before death. The first appearance of rigor mortis was seen at 1 hour and 25 min. after death (temp. of laboratory, 62° F.).
149.	3 lbs. 6 oz.	1·55	1·4	4·05	Death, in 49 min. after the administration of physostigma.	*With atropia*, in 4 min. 30 sec., dilatation from $\frac{14}{50} \times \frac{13}{50}$ to $\frac{15}{50} \times \frac{15}{50}$. *After physostigma*, the size was in 45 min., $\frac{14}{50} \times \frac{14}{50}$.	*With atropia*, in 4 min., acceleration from 37 to 54 per 10 sec. *After physostigma*, no observation could be made until 13 min., when the rate per 10 sec. was about 40; and in 44 min., it was 22.	*With atropia*, none noted. *After physostigma*, the respirations were rapid until 20 min., and they then diminished in frequency. In 33 min., the rate per 10 sec. was only 6; and afterwards gasps occurred at rare intervals until death.	*With atropia*, none. *After physostigma*, neither defæcation nor urination occurred, nor was the secretion of any buccal gland increased.	*With atropia*, none. *After physostigma*, in 9 min., slight paralysis; and in 25 min., general flaccidity. Tremors and weak spasms frequently occurred. Fibrillary twitches were present in a well-marked form until 18 min. after the injection of physostigma, but soon afterwards they disappeared. There was no rigor within 48 min. after death (temp. of laboratory, 58° F.).
150.	3 lbs. 2 oz.	2	1·9	3·7	Death, in 21 min. after the administration of physostigma.	*With atropia*, none noted. *After physostigma*, none noted.	*With atropia*, none noted. *After physostigma*, none noted.	*With atropia*, none. *After physostigma*, slowing occurred, and in 19 min. the rate per 10 sec. was 11.	*With atropia*, none. *After physostigma*, none. Neither defæcation nor urination occurred; nor was the secretion of any buccal gland increased.	*With atropia*, none. *After physostigma*, in 13 min., slight paralysis; and in 17 min., flaccidity. Tremors and spasms frequently occurred, and fibrillary twitches were present in a well-marked form.

TABLE 7.—EXPERIMENTS WITH THREE AND A HALF TIMES THE MINIMUM-LETHAL DOSE OF PHYSOSTIGMA (4·2 *grs. of Extract of Physostigma per Three Pounds Weight of Rabbit*).

Number of Experiment.	Weight of Rabbit.	Doses of Sulphate of Atropia (in Grains). Actual Dose.	Doses of Sulphate of Atropia (in Grains). Dose p. 3 lbs. of Animal.	Dose of Physostigma (in Grains). Actual Dose of Extract.	Result.	Effect on the Pupils. (The Measurements are in fiftieths of an inch.)	Effect on the Heart.	Effect on the Respirations.	Effect on Secretion and Excretion.	Effects on Motility, &c.
151.	3 lbs. 6 oz.	0·05	0·044	4·7	Death, in 1 hour 18 min. after the administration of physostigma.	*With atropia*, in 3 min., dilatation from $\frac{1}{50} \times \frac{1}{50}$ to $\frac{17}{50} \times \frac{17}{50}$. *After physostigma*, in 4 min., the size was $\frac{17}{50} \times \frac{17}{50}$; afterwards slight contraction occurred; but in 1 hour, the size was again $\frac{17}{50} \times \frac{17}{50}$, and continued so until death.	*With atropia*, in 4 min., acceleration from 39 to 48 per 10 sec. *After physostigma*, in 4 min., the rate per 10 sec. was 49. After this, no observation was made until 1 hour 7 min., when the rate per 10 sec. was 35. Afterwards it rapidly slowed.	*With atropia*, none. *After physostigma*, in 17 min., slowing had occurred from the original rate of 21 per 10 sec. to 18. In 25 min., the rate per 10 sec. was 15; in 35 min., 13; in 52 min., 9; in 1 hour, 5; and afterwards irregular gasps occurred until death.	*With atropia*, none. *After physostigma*, none. Neither defæcation nor urination occurred, nor was the secretion of any buccal gland increased.	*With atropia*, none. *After physostigma*, in 7 min., slight paralysis; and in 48 min., general flaccidity. Tremors and spasms frequently occurred, and fibrillary twitches were well developed.
152.	2 lbs. 13 oz.	0·075	0·071	3·9	Death, in 21 min. after the administration of physostigma.	*With atropia*, in 4 min., dilatation from $\frac{13}{50} \times \frac{11}{50}$ to $\frac{14}{50} \times \frac{14}{50}$. *After physostigma*, the size was in 5 min., $\frac{15}{50} \times \frac{15}{50}$; and in 21 min., $\frac{19}{50} \times \frac{20}{50}$.—After death in 7 min., the size was $\frac{9}{50} \times \frac{8}{50}$.	*With atropia*, in 3 min., acceleration from 41 to 47 per 10 sec. *After physostigma*, in 5 min., the rate per 10 sec. was 48. Further observations were not made until 20 min., when the rate per 10 sec. was 13.	*With atropia*, none. *After physostigma*, the rate soon diminished, and in 14 min. infrequent gasps merely were occurring.	*With atropia*, none. *After physostigma*, none.	*With atropia*, none. *After physostigma*, in 7 min., slight paralysis; and in 13 min., general flaccidity. Very feeble tremors occurred, though only at about 10 min. after the administration of physostigma. Fibrillary twitches were well developed, and continued after death.
153.	2 lbs. 15 oz.	0·1	0·1	4·1	Recovery.	*With atropia*, in 4 min. 30 sec., dilatation from $\frac{13}{50} \times \frac{11}{50}$ to $\frac{15}{50} \times \frac{15}{50}$. *After physostigma*, the size remained $\frac{15}{50} \times \frac{15}{50}$ for more than 2 hours.—On the following day, it was $\frac{15}{50} \times \frac{15}{50}$; and on the 3d day, $\frac{14}{50} \times \frac{14}{50}$.	*With atropia*, in 3 min., acceleration from 37 to 44 per 10 sec. *After physostigma*, no observations were made until 1 hour 50 min., when the rate per 10 sec. was 45.—On the following day, it was 27; and on the 3d day, 41.	*With atropia*, in 4 min., slowing from 18 to 16 per 10 sec. *After physostigma*, the rate per 10 sec. was in 33 min., 18; in 1 hour, 14; and in 2 hours, 15.	*With atropia*, none. *After physostigma*, in 22 min., several normal fæcal pellets were passed; and also in 38 min., with a few drops of urine. No salivation occurred, nor was the secretion of any buccal gland increased.	*With atropia*, none. *After physostigma*, in 7 min., slight paralysis; in 33 min., advanced paralysis; in 1 hour 6 min., general flaccidity; and in 2 hours, decided, though lessened paralysis. Tremors early occurred, and were frequently repeated. Fibrillary twitches were present in a very well-marked form until 2 hours 10 min. at least.*

* On the 6th day, this rabbit looked ill and went about sluggishly. It gradually lost weight; until on the 19th day, it had a weight of only 2 lbs. 5 oz. On the 20th day, it was dead.

Number of Experiment.	Weight of Rabbit.	Doses of Sulphate of Atropia (in Grains). Actual Dose.	Doses of Sulphate of Atropia (in Grains). Dose p. 3 lbs. of Animal.	Dose of Physostigma (in Grains). Actual Dose of Extract.	Result.	Effect on the Pupils. (The Measurements are in fiftieths of an inch.)	Effect on the Heart.	Effect on the Respirations.	Effect on Secretion and Excretion.	Effects on Motility, &c.
154. *a* (Experiment *b* was performed nine days after experiment *a*.)	3 lbs.	0·2	0·2	4·2	Recovery.	*With atropia*, in 4 min., dilatation from $\frac{14}{50} \times \frac{13}{50}$ to $\frac{17}{50} \times \frac{17}{50}$. *After physostigma*, the size continued $\frac{17}{50} \times \frac{17}{50}$ for at least 3 hours.—On the following day, it was still $\frac{17}{50} \times \frac{17}{50}$; on the 4th day, it was $\frac{10}{50} \times \frac{10}{50}$; and on the 9th day, $\frac{14}{50} \times \frac{13}{50}$.	*With atropia*, in 4 min. 20 sec., acceleration from 39 to 50 per 10 sec. *After physostigma*, the rate per 10 sec. was in 3 min., 58; and in 1 hour 55 min., 48.—On the following day, the rate per 10 sec. was 45.	*With atropia*, in 3 min., acceleration from 18 to 22 per 10 sec. *After physostigma*, the rate per 10 sec. was in 23 min., 19; in 39 min., 17; in 50 min., 14; and in 2 hours, 15.	*With atropia*, none. *After physostigma*, none. Neither defæcation nor urination occurred, nor was the secretion of any buccal gland increased.	*With atropia*, none. *After physostigma*, in 7 min., slight paralysis; and in 18 min., general flaccidity. The paralysis began to lessen in about 1 hour 10 min.; and in 2 hours 30 min., was only slight. Tremors and feeble starts occurred frequently, and fibrillary twitches were very well marked, even at 3 hours.
b	2 lbs. 15½ oz.	0	0	1·2 (= nearly 1·2 gr. per 3 lbs.)	Death, in 12 min. 30 sec.	—	—	—	—	—
155.	3 lbs.	0·3	0·3	4·2	Death, in 45 min. after the administra- of physostigma.	*With atropia*, in 3 min., dilatation from $\frac{14}{50} \times \frac{13}{50}$ to $\frac{14}{50} \times \frac{14}{50}$. *After physostigma*, the size was in 2 min., $\frac{13}{50} \times \frac{13}{50}$; in 12 min., $\frac{14}{50} \times \frac{14}{50}$; in 20 min., $\frac{9}{50} \times \frac{8}{50}$; in 35 min., $\frac{5}{50} \times \frac{4}{50}$; and in 45 min., $\frac{5}{50} \times \frac{4}{50}$. —After death, in 3 min., the size was $\frac{11}{50} \times \frac{11}{50}$; and in 35 min., $\frac{7}{50} \times \frac{6}{50}$.	*With atropia*, in 4 min. 30 sec., acceleration from 44 to 53 per 10 sec. *After physostigma*, no observations were made in order to avoid interference with the result of the experiment.	*With atropia*, none noted. *After physostigma*, the respirations slowed until death. In 38 min., moist sounds occurred now and then, and they continued to do so until death.	*With atropia*, none. *After physostigma*, neither defæcation nor urination occurred; but the secretion of certain buccal or laryngeal glands was a little increased.	*With atropia*, none. *After physostigma*, in 8 min., decided paralysis; and in 20 min., general flaccidity, which remained until death. Tremors frequently occurred, and fibrillary twitches were present in a very well-marked form. — After death, in 35 min., only a faint degree of rigor was present in the posterior extremities (temp. of laboratory 57° F.).
156.	3 lbs. 2 oz.	0·52	0·5	4·37	Death, in 42 min. after the administration of physostigma.	*With atropia*, in 3 min., dilatation from $\frac{14}{50} \times \frac{13}{50}$ to $\frac{15}{50} \times \frac{15}{50}$. *After physostigma*, further dilatation to $\frac{17}{50} \times \frac{17}{50}$, occurred in 3 min., and continued until death. — After death, the size was in 4 min., $\frac{15}{50} \times \frac{15}{50}$.	*With atropia*, in 4 min., acceleration from 36 to 50 per 10 sec. *After physostigma*, the rate per 10 sec. was in 21 min., 42; and in 36 min., 24.	*With atropia*, none noted. *After physostigma*, the rate per 10 sec. was in 11 min., 13; in 21 min., 6; and in 24 min., 5. Afterwards, irregular and feeble gasps occurred until death.	*With atropia*, none noted. *After physostigma*, none. Neither defæcation nor urination occurred, nor was the secretion of any buccal gland increased.	*With atropia*, none noted. *After physostigma*, in 7 min., slight paralysis; and in 15 min., general flaccidity, which increased until death. Tremors and spasms frequently occurred. Fibrillary twitches were well marked in the earlier part of the experiment; but none were present after 20 min. —After death, rigor had not set in at 35 min.

Number of Experiment.	Weight of Rabbit.	Doses of Sulphate of Atropia (in Grains). Actual Dose.	Doses of Sulphate of Atropia (in Grains). Dose p. 3 lbs. of Animal.	Dose of Physostigma (in Grains). Actual Dose of Extract.	Result.	Effect on the Pupils. (The Measurements are in fiftieths of an inch.)	Effect on the Heart.	Effect on the Respirations.	Effect on Secretion and Excretion.	Effects on Motility, &c.
157.	3 lbs. 5 oz.	1·1	1	4·6	Death, in 29 min. after the administration of physostigma.	*With atropia*, in 3 min., dilatation from $\frac{1\cdot3}{50} \times \frac{1\cdot2}{50}$ to $\frac{1\cdot6}{50} \times \frac{1\cdot6}{50}$. *After physostigma*, further dilatation soon took place to $\frac{1\cdot8}{50} \times \frac{1\cdot8}{50}$; and this size was maintained until death.—After death, in 5 min., the size was $\frac{1\cdot4}{50} \times \frac{1\cdot3}{50}$.	*With atropia*, in 4 min., acceleration from 39 to 52 per 10 sec. *After physostigma*, in 4 min., the rate per 10 sec. was 53. Twitches and tremors prevented any exact observations being subsequently made; but in 22 min., the impulse was rapid.	*With atropia*, none noted. *After physostigma*, the rate per 10 sec. was in 14 min., 18; in 19 min., 12; and in 20 min., 2. Afterwards, feeble gasps occurred at irregular intervals until death.	*With atropia*, none. *After physostigma*, neither defecation nor urination occurred; but the secretion of certain buccal or bronchial glands was shown to be increased by moist sounds occasionally accompanying the respirations.	*With atropia*, none. *After physostigma*, in 8 min., slight paralysis; and in 15 min., general flaccidity, which increased until death. Tremors and feeble convulsive spasms frequently occurred; and fibrillary twitches were present in a very well-marked form until 17 min. after the administration of physostigma. Rigor had not set in at 1 hour after death.

SERIES I.—*continued.*

TABLE 8.—EXPERIMENTS WITH FOUR TIMES THE MINIMUM-LETHAL DOSE OF PHYSOSTIGMA (4·8 *grs. of Extract of Physostigma per Three Pounds Weight of Rabbit*).

Number of Experiment.	Weight of Rabbit.	Doses of Sulphate of Atropia (in Grains). Actual Dose.	Doses of Sulphate of Atropia (in Grains). Dose p. 3 lbs. of Animal.	Dose of Physostigma (in Grains). Actual Dose of Extract.	Result.	Effect on the Pupils. (The Measurements are in fiftieths of an inch.)	Effect on the Heart.	Effect on the Respirations.	Effect on Secretion and Excretion.	Effects on Motility, &c.
158.	3 lbs.	0·1	0·1	4·8	Death, in 41 min. after the administration of physostigma.	*With atropia*, in 4 min. 30 sec., dilatation from $\frac{1\cdot3}{50} \times \frac{1\cdot1}{50}$ to $\frac{1\cdot5}{50} \times \frac{1\cdot5}{50}$. *After physostigma*, the size was, in 5 min., $\frac{1\cdot6}{50} \times \frac{1\cdot6}{50}$; in 9 min., $\frac{1\cdot7}{50} \times \frac{1\cdot7}{50}$; in 21 min., $\frac{1\cdot9}{50} \times \frac{2\cdot0}{50}$; in 25 min., $\frac{2\cdot0}{50} \times \frac{2\cdot0}{50}$; and in 39 min., $\frac{2\cdot0}{50} \times \frac{2\cdot0}{50}$.—After death it was, in 1 min., $\frac{2\cdot0}{50} \times \frac{2\cdot0}{50}$; in 15 min., $\frac{2\cdot0}{50} \times \frac{2\cdot0}{50}$; and in 1 hour 20 min., $\frac{1\cdot9}{50} \times \frac{1\cdot9}{50}$.	*With atropia*, in 4 min., acceleration from 39 to 52 per 10 sec. *After physostigma*, the rate per 10 sec. was, in 2 min., 52; in 4 min., 45; in 7 min., 39; in 25 min., 28; and in 30 min., 30.	*With atropia*, in 3 min., acceleration from 23 to 26 per 10 sec. *After physostigma*, the rate per 10 sec. was, in 4 min., 22; in 20 min., 18; in 24 min., 5; and in 24 min., 4. Afterwards, only very feeble and irregularly occurring respirations took place until death.	*With atropia*, none. *After physostigma*, in 8 min., the secretion of certain bronchial glands was slightly increased, but this ceased in a few minutes. In 20 min., 2 or 3 normal fæcal pellets were passed. There was no salivation nor urination.	*With atropia*, none. *After physostigma*, in 1 min. 30 sec., slight and infrequent fibrillary twitches, which soon became very well marked, but again became slight shortly before death. In 12 min., distinct paralysis, and in 22 min., general flaccidity. Frequently, tremors occurred, and, more rarely, there were spasms.—After death, the first appearance of rigor was at about 1 hour 20 min. (temp. of laboratory, 59° F.).

Number of Experiment.	Weight of Rabbit.	Doses of Sulphate of Atropia (in Grains). Actual Dose.	Doses of Sulphate of Atropia (in Grains). Dose p. 3 lbs. of Animal.	Dose of Physostigma (in Grains). Actual Dose of Extract.	Result.	Effect on the Pupils. (The Measurements are in fiftieths of an inch.)	Effect on the Heart.	Effect on the Respirations.	Effect on Secretion and Excretion.	Effects on Motility, &c.
159.	3 lbs. 1 oz.	0·15	0·15	4·9	Death, in 1 hour 9 min. after the administration of physostigma.	*With atropia*, in 3 min., dilatation from $\frac{14}{50} \times \frac{13}{50}$ to $\frac{16}{50} \times \frac{16}{50}$. *After physostigma*, the size was in 1 min., $\frac{17}{50} \times \frac{17}{50}$; in 37 min., $\frac{13}{50} \times \frac{15}{50}$; and in 1 hour 8 min., $\frac{17}{50} \times \frac{17}{50}$. — After death, it was, in 3 min., $\frac{15}{50} \times \frac{15}{50}$; in 6 min., $\frac{12}{50} \times \frac{13}{50}$; in 13 min., $\frac{10}{50} \times \frac{10}{50}$; and in 45 min., $\frac{13}{50} \times \frac{13}{50}$.	*With atropia*, in 4 min., acceleration from 42 to 57 per 10 sec. *After physostigma*, the rate per 10 sec. was in 3 min., 59; in 9 min., 49; in 50 min., 47; in 1 hour, 45; in 1 hour 3 min., 46; in 1 hour 5 min., 36; and in 1 hour 8 min., 36.	*With atropia*, none. The original rate was 32 per 10 sec. *After physostigma*, the rate per 10 sec. was in 3 min., 37; in 12 min., 20; in 22 min., 16; in 51 min., 15; and in 59 min., 6. — Afterwards, only gasping movements occurred irregularly.	*With atropia*, none. *After physostigma*, none. There was no defæcation, urination, nor salivation.	*With atropia*, none. *After physostigma*, in 2 min., slight and infrequent fibrillary twitches, which soon became well marked. In 7 min., slight paralysis; and in 27 min., general flaccidity. Tremors occurred frequently. — After death, the first appearance of rigor was at about 45 min. (temp. of laboratory, 58° F.).
160.	3 lbs.	0·2	0·2	4·8	Death, in 43 min. after the administration of physostigma.	*With atropia*, in 3 min., dilatation from $\frac{13}{50} \times \frac{11}{50}$ to $\frac{15}{50} \times \frac{15}{50}$. *After physostigma*, the size was in 7 min., $\frac{17}{50} \times \frac{17}{50}$; in 26 min., $\frac{14}{50} \times \frac{14}{50}$; in 32 min., $\frac{15}{50} \times \frac{15}{50}$; and in 43 min., $\frac{18}{50} \times \frac{18}{50}$. — After death, it was, in 1 min., $\frac{17}{50} \times \frac{17}{50}$; in 4 min., $\frac{14}{50} \times \frac{14}{50}$; in 9 min., $\frac{13}{50} \times \frac{14}{50}$; and in 57 min., $\frac{10}{50} \times \frac{10}{50}$.	*With atropia*, in 4 min., acceleration from 41 to 54 per 10 sec. *After physostigma*, the rate per 10 sec. was in 4 min., 45; in 7 min., 43; in 26 min., 37; in 32 min., 36; in 39 min., 22; and in 42 min., 19.	*With atropia*, in 3 min. 30 sec., slowing from 19 to 14 per 10 sec. *After physostigma*, the rate per 10 sec. was in 5 min., 17; in 10 min., 19; in 25 min., 12; in 32 min., 5; and in 35 min., 3. — Afterwards, only infrequent gasping movements occurred.	*With atropia*, none. *After physostigma*, none. There was no defæcation, urination, nor salivation.	*With atropia*, none. *After physostigma*, in 2 min., infrequent fibrillary twitches, which afterwards became only slightly developed. In 8 min., distinct paralysis; and in 28 min., general flaccidity. Frequently tremors occurred. — Rigor had not begun at 57 min. after death (temp. of laboratory 56° F.).
161	4 lbs. 2 oz.	0·275	0·2	6·6	Death, in 34 min. after the administration of physostigma.	*With atropia*, in 3 min., dilatation from $\frac{13}{50} \times \frac{13}{50}$ to $\frac{16}{50} \times \frac{15}{50}$. *After physostigma*, the size was in 7 min., $\frac{15}{50} \times \frac{15}{50}$; in 22 min., $\frac{14}{50} \times \frac{13}{50}$; and in 32 min., $\frac{12}{50} \times \frac{11}{50}$. — After death, it was, in 2 min., $\frac{16}{50} \times \frac{16}{50}$.	*With atropia*, in 4 min., acceleration from 40 to 58 per 10 sec. *After physostigma*, the rate per 10 sec. was in 3 min., 53; in 24 min., 44; in 28 min., 22; and in 30 min., 18.	*With atropia*, none. The original rate was 23 per 10 sec. *After physostigma*, the rate per 10 sec. was in 2 min., 18; in 26 min., 13; and in 28 min., 9. Afterwards, only feeble gasps occurred.	*With atropia*, none. *After physostigma*, in 4 min., the secretion of certain buccal glands was slightly increased, but only for a few minutes; and in 24 min., several normal fæcal pellets were passed. There was no urination.	*With atropia*, none. *After physostigma*, in 2 min., fibrillary twitches. In 8 min., slight paralysis; and in 22 min., general flaccidity. Tremors and spasms frequently occurred. — After death, there was decided but not strong rigor, at 1 hour 10 min. (temp. of laboratory, 59° F.).
162.	3 lbs. 12 oz.	0·37	0·3	6·	Death, in 1 hour 24 min. after the administration of physostigma.	*With atropia*, in 4 min., dilatation from $\frac{15}{50} \times \frac{14}{50}$ to $\frac{17}{50} \times \frac{17}{50}$. *After physostigma*, the size was in 30 sec., $\frac{15}{50} \times \frac{15}{50}$; and in 1 hour 24 min., $\frac{15}{50} \times \frac{15}{50}$. — After death, it was, in 2 min., $\frac{16}{50} \times \frac{16}{50}$; and in 22 min., $\frac{15}{50} \times \frac{15}{50}$.	*With atropia*, in 3 min. 30 sec., acceleration from 42 to 59 per 10 sec. *After physostigma*, the rate per 10 sec. was in 4 min., 54; in 56 min., 60; in 1 hour, 46; in 1 hour 5 min., 41; in 1 hour 14 min., 37; and in 1 hour 22 min., 25.	*With atropia*, none. The original rate was 19 per 10 sec. *After physostigma*, the rate per 10 sec. was in 17 min., 16; in 48 min., 13; in 57 min., 8; in 59 min., 4; and in 1 hour 14 min., 3. Afterwards, only infrequent gasps occurred.	*With atropia*, none. *After physostigma*, none. There was no defæcation, urination, nor salivation.	*With atropia*, none. *After physostigma*, in 1 min. 30 sec., infrequent fibrillary twitches, which soon became very well marked, but were only slight shortly before death. In 6 min., slight paralysis; and in 55 min., general flaccidity. Tremors frequently occurred. — After death, there was no rigor at 23 min.

SERIES II.—DETERMINATION OF THE LIMITS OF ANTAGONISM WHEN ATROPIA IS ADMINISTERED FIVE MINUTES AFTER PHYSOSTIGMA.

TABLE 1.—Experiments with half the Minimum-Lethal Dose of Physostigma (0·06 *gr. of Sulphate of Physostigmia per Three Pounds Weight of Rabbit*).

Number of Experiment.	Weight of Rabbit.	Dose of Physostigma (in Grains). Actual Dose of Sul. of Physostigmia.	Doses of Sulphate of Atropia (in Grains). Actual Dose.	Doses of Sulphate of Atropia (in Grains). Dose p. 3 lbs. of Animal.	Result.	Effect on the Pupils. (The Measurements are in fiftieths of an inch.)	Effect on the Heart.	Effect on the Respirations.	Effect on Secretion and Excretion.	Effects on Motility, &c.
163.	2 lbs. 14 oz.	0·058	4·79	5	Recovery.	*With physostigma*, none. The original size was $\frac{13}{50} \times \frac{13}{50}$. *After atropia*, the size was in 4 min., $\frac{15}{50} \times \frac{15}{50}$; and in 1 hour, $\frac{15}{50} \times \frac{15}{50}$. —On the following day, it was $\frac{17}{50} \times \frac{17}{50}$.	*With physostigma*, in 4 min., slowing from 39 to 38 per 10 sec. *After atropia*, the rate per 10 sec. was in 2 min., 58; in 4 min., 60; in 16 min., 62; and in 1 hour, 51.—On the following day, it was 50; and on the 3rd day, 40.	*With physostigma*, in 3 min., acceleration from 25 to 28 per 10 sec. *After atropia*, the rate per 10 sec. was in 3 min., 32; in 14 min., 18; and in 1 hour 2 min., 22.—On the following day, it was 26; and on the 3d day, 22.	*With physostigma*, none. *After atropia*, none. There was no defæcation, urination, nor salivation during the 1 hour and 5 min. of continuous observation.	*With physostigma*, in 1 min., slight and infrequent fibrillary twitches. *After atropia*, the fibrillary twitches soon became pretty well marked, and they continued so for more than 1 hour. In 15 min., slight paralysis, which did not increase within 50 min. There were no tremors nor spasms.
164.	2 lbs. 14 oz.	0·058	6·7	7	Recovery.	*With physostigma*, none. The original size was $\frac{11}{50} \times \frac{11}{50}$. *After atropia*, the size was in 1 min. 30 sec., $\frac{14}{50} \times \frac{14}{50}$; in 3 min., $\frac{15}{50} \times \frac{15}{50}$; in 14 min., $\frac{15}{50} \times \frac{15}{50}$; and in 1 hour 14 min., $\frac{14}{50} \times \frac{14}{50}$.—On the following day, it was $\frac{16}{50} \times \frac{17}{50}$.	*With physostigma*, in 4 min. 30 sec., slowing from 40 to 32 per 10 sec. *After atropia*, the rate per 10 sec. was in 4 min., 53; in 30 min., 38; in 1 hour 18 min., 28; in 1 hour 40 min., 32; and in 2 hours 13 min., 36.—On the following day, it was 33; and on the 3rd day, 60.	*With physostigma*, in 3 min. 30 sec., slowing from 22 to 19 per 10 sec. *After atropia*, the rate per 10 sec. was in 3 min., 20; in 14 min., 15; in 1 hour 16 min, 17; in 1 hour 35 min., 19; and in 2 hours 14 min., 13.—On the following day, it was 12; and on the 3rd day, 13.	*With physostigma*, none. *After atropia*, none. There was no defæcation, urination, nor salivation during the 2 hours and 15 min. of continuous observation.	*With physostigma*, in 2 min., slight and infrequent fibrillary twitches. *After atropia*, in 14 min., the fibrillary twitches had disappeared. In 12 min., slight paralysis; and in 40 min., decided paralysis, which had not lessened in 2 hours 15 min. Feeble tremors and starts occasionally took place.
165.	2 lbs. 14 oz.	0·058	6·87	7·5	Recovery.	*With physostigma*, none. The original size was $\frac{13}{50} \times \frac{13}{50}$. *After atropia*, the size was in 2 min., $\frac{15}{50} \times \frac{15}{50}$; and in 4 hours 5 min., $\frac{16}{50} \times \frac{16}{50}$.—On the following day, it was $\frac{17}{50} \times \frac{17}{50}$; and on the 7th day, $\frac{18}{50} \times \frac{18}{50}$.	*With physostigma*, in 4 min. 30 sec., slowing from 43 to 32 per 10 sec. *After atropia*, the rate per 10 sec. was in 2 min., 58; in 4 min., 63; in 7 min., 67; in 30 min., 50; in 1 hour, 43; in 1 hour 25 min., 38; and in 2 hours 35 min., 32.—On the following day, it was 42; and on the 7th day, 40.	*With physostigma*, none. The original rate was 23 per 10 sec. *After atropia*, the rate per 10 sec. was in 5 min., 26; in 10 min., 30; in 31 min., 27; in 57 min., 17; and in 4 hours, 16.	*With physostigma*, none. *After atropia*, none. There was no defæcation, urination, nor salivation during the 4 hours and 5 min. of continuous observation.	*With physostigma*, in 1 min., slight and infrequent fibrillary twitches. *After atropia*, the fibrillary twitches soon became well marked, but in 4 hours they had altogether disappeared. In 15 min., slight paralysis; in 45 min., well-marked paralysis; and in 3 hours 40 min., no paralysis. Frequently tremors and feeble spasms occurred.

Number of Experiment.	Weight of Rabbit.	Dose of Physostigma (in Grains). Actual Dose of Sul. of Physostigmia.	Doses of Sulphate of Atropia (in Grains). Actual Dose.	Doses of Sulphate of Atropia (in Grains). Dose p. 3 lbs. of Animal	Result.	Effect on the Pupils. (The Measurements are in fiftieths of an inch.)	Effect on the Heart.	Effect on the Respirations.	Effect on Secretion and Excretion.	Effects on Motility, &c.
166.	2 lbs. 14 oz.	0·058	7·45	8	Death, in more than 1 hour 40 min. after the administration of physostigma.	*With physostigma*, none. The original size was $\frac{13}{50} \times \frac{13}{50}$. *After atropia*, the size was in 3 min., $\frac{17}{50} \times \frac{17}{50}$; in 50 min., $\frac{15}{50} \times \frac{15}{50}$; and in 1 hour 10 min., $\frac{16}{50} \times \frac{16}{50}$.	*With physostigma*, in 4 min. 30 sec., slowing from 39 to 38 per 10 sec. *After atropia*, the rate per 10 sec. was in 4 min., 49; in 6 min., 56; in 28 min., 42; and in 40 min., about 24. Afterwards, the impulse was too feeble to be counted.	*With physostigma*, none. The original rate was 17 per 10 sec. *After atropia*, the rate per 10 sec. was in 4 min., 16; in 7 min., 14; in 50 min., 12; and in 1 hour 38 min., 8.	*With physostigma*, none. *After atropia*, none. There was no defæcation, urination, nor salivation during the 1 hour and 40 minutes of continuous observation.	*With physostigma*, in 2 min., slight and infrequent fibrillary twitches. *After atropia*, in 24 min., the fibrillary twitches had disappeared. In 14 min., slight paralysis; in 35 min., well-marked paralysis; and in 1 hour 40 min., well-marked paralysis. Frequently, feeble tremors and starts occurred.
167.	3 lbs. 2 oz.	0·062	8·5	8·16	Death, in 2 hours 31 min. after the administration of physostigma.	*With physostigma*, none. The original size was $\frac{13}{50} \times \frac{13}{50}$. *After atropia*, the size was in 3 min., $\frac{17}{50} \times \frac{17}{50}$; in 9 min., $\frac{15}{50} \times \frac{15}{50}$; in 15 min., $\frac{17}{50} \times \frac{17}{50}$; and in 1 hour 26 min., $\frac{17}{50} \times \frac{17}{50}$.—After death, it was in 2 min., $\frac{16}{50} \times \frac{16}{50}$; in 5 min., $\frac{14}{50} \times \frac{14}{50}$; and in 16 min., $\frac{13}{50} \times \frac{13}{50}$.	*With physostigma*, in 4 min. 30 sec., slowing from 38 to 37 per 10 sec. *After atropia*, the rate per 10 sec. was in 4 min., 48; in 13 min., 52; in 30 min., 49; in 43 min., 42; and in 45 min., 30. Afterwards, the impulse was too feeble to be counted.	*With physostigma*, none. The original rate was 16 per 10 sec. *After atropia*, the rate per 10 sec. was in 4 min., 20; in 7 min. 29; in 29 min., 16; in 57 min., 10; and in 2 hours 22 min., 6. Afterwards, only infrequent gasps occurred.	*With physostigma*, none. *After atropia*, none. There was no defæcation, urination, nor salivation.	*With physostigma*, in 2 min., slight and infrequent fibrillary twitches. *After atropia*, in 50 min., the fibrillary twitches had altogether disappeared. In 30 min., slight paralysis; in 53 min., well-marked paralysis; and in 2 hours hours 16 min., general flaccidity. Frequently, tremors and feeble spasms occurred.—After death, there was no rigor at 28 min.

SERIES II.—*continued.*

TABLE 2.—EXPERIMENTS WITH THE MINIMUM-LETHAL DOSE OF PHYSOSTIGMA (0·12 *gr. of Sulphate of Physostigmia per Three Pounds Weight of Rabbit*).

Number of Experiment.	Weight of Rabbit.	Dose of Physostigma (in Grains). Actual Dose of Sul. of Physostigmia.	Doses of Sulphate of Atropia (in Grains). Actual Dose.	Doses of Sulphate of Atropia (in Grains). Dose p. 3 lbs. of Animal.	Result.	Effect on the Pupils. (The Measurements are in fiftieths of an inch.)	Effect on the Heart.	Effect on the Respirations.	Effect on Secretion and Excretion.	Effects on Motility, &c.
168.	3 lbs. 12 oz.	0·15	0·012	0·01	Death, in 1 hour 15 min. after the administration of physostigma.	*With physostigma*, in 4 min., dilatation from $\frac{13}{50} \times \frac{13}{50}$ to $\frac{14}{50} \times \frac{13}{50}$. *After atropia*, the size was in 4 min., $\frac{17}{50} \times \frac{17}{50}$; in 13 min., about $\frac{12}{50} \times \frac{12}{50}$; in 35 min., $\frac{14}{50} \times \frac{14}{50}$; in 39 min., $\frac{11}{50} \times \frac{11}{50}$; in 43 min., $\frac{14}{50} \times \frac{14}{50}$; in 55 min., $\frac{10}{50} \times \frac{10}{50}$; and in 1 hour 3 min., $\frac{14}{50} \times \frac{13}{50}$, which size remained until death. — After death, the size was in 1 min., $\frac{11}{50} \times \frac{10}{50}$; and in 3 min., $\frac{10}{50} \times \frac{9}{50}$.	*With physostigma*, in 4 min. 30 sec., slowing from 42 to 37 per 10 sec. *After atropia*, the rate per 10 sec. was in 7 min., 47; in 11 min., 43; and it gradually slowed from this until death.	*With physostigma*, none noted. *After atropia*, the rate per 10 sec. was in 13 min., 18. Soon after it began to slow, and also the movements began to get feeble, until in 50 min., only rare gasps occurred.	*With physostigma*, none. *After atropia*, in 30 min., slight salivation occurred, and continued until death. In 40 min., one fæcal pellet was passed. No urine was voided.	*With physostigma*, in 2 min. 30 sec., faint and infrequent fibrillary twitches. *After atropia*, in 5 min., slight paralysis; and in 8 min., decided paralysis; and in 28 min., general flaccidity. Tremors frequently occurred, and fibrillary twitches continued in a well-marked form until death.

Number of Experiment.	Weight of Rabbit.	Dose of Physostigma (in Grains). Actual Dose of Sul. of Physostigmia.	Doses of Sulphate of Atropia (in Grains). Actual Dose.	Doses of Sulphate of Atropia (in Grains). Dose p. 3 lbs. of Animal.	Result.	Effect on the Pupils. (The Measurements are in fiftieths of an inch.)	Effect on the Heart.	Effect on the Respirations.	Effect on Secretion and Excretion.	Effects on Motility, &c.
169.	3 lbs. 3 oz.	0·127	0·016	0·015	Death, in 17 min. after the administration of physostigma.	*With physostigma*, none noted. *After atropia*, contraction soon occurred; and in 7 min., the size was $\frac{7}{50} \times \frac{6}{50}$.	*With physostigma*, none noted. *After atropia*, none noted.	*With physostigma*, none noted. *After atropia*, slowing occurred until death, and the movements were greatly embarrased by mucus in the larynx and fluid in the mouth.	*With physostigma*, none noted. *After atropia*, in 6 min., several normal fæcal pellets were passed; in 8 min., slight salivation had occurred, which increased considerably before death.	*With physostigma*, none noted. *After physostigma*, in 6 min., distinct paralysis; and in 10 min., general flaccidity. Fibrillary twitches were present until death in a well-marked form.
170. *a*	3 lbs. 3 oz. [Experiment *b* was performed eight days after experiment *a*.]	0·128	0·02	0·02	Recovery.	*With physostigma*, none. *After atropia*, the size was in 4 min., $\frac{10}{50} \times \frac{9}{50}$; in 12 min., $\frac{14}{50} \times \frac{14}{50}$; in 20 min., $\frac{16}{50} \times \frac{16}{50}$; and in 1 hour, $\frac{18}{50} \times \frac{18}{50}$.—On the following day it was $\frac{18}{50} \times \frac{9}{50}$.	*With physostigma*, none noted. *After atropia*, no observations were made until the following day, when the rate per 10 sec. was 36. On the 5th day, it was 46 per 10 sec.	*With physostigma*, none. *After atropia*, in 26 min., slowing had occurred from the original rate of 19 to 15 per 10 sec.	*With physostigma*, none. *After atropia*, in 3 min., the secretion of certain buccal glands was slightly increased; in 6 min., salivation occurred, but it had ceased by 13 min. In 1 hour 8 min., a little urine was voided.	*With physostigma*, in 2 min., infrequent fibrillary twitches. *After atropia*, in 5 min., slight paralysis; in 30 min., general flaccidity; and in 1 hour 10 min., only slight paralysis. Tremors and general feeble spasms frequently occurred, and fibrillary twitches were present in a well-marked form until after 1 hour 10 min.
	b 3 lbs. 4 oz.	0·13 (= 0·12 gr. p. 3 lbs.	0	0	Death, in 13 min.	—	—	—	—	—
171. *a*	3 lbs. 6 oz. [Experiment *b* was performed eleven days after experiment *a*.]	0·135	0·056	0·05	Recovery.	*With physostigma*, none. *After atropia*, the size was in 1 min., $\frac{11}{50} \times \frac{10}{50}$; in 10 min., $\frac{16}{50} \times \frac{16}{50}$; in 15 min., $\frac{18}{50} \times \frac{18}{50}$; in 40 min., $\frac{18}{50} \times \frac{18}{50}$; in 1 hour 25 min., $\frac{18}{50} \times \frac{18}{50}$; and in 2 hours 30 min., $\frac{10}{50} \times \frac{9}{50}$.—On the following day, it was $\frac{11}{50} \times \frac{10}{50}$.	*With physostigma*, in 4 min. 30 sec., slowing from 39 to 34 per 10 sec. *After atropia*, the rate per 10 sec. was in 10 min., 40; and in 2 hours 30 min., 37.—On the following day it was 37.	*With physostigma*, in 3 min., slowing from 16 to 13 per 10 sec. *After atropia*, in 18 min., the rate per 10 sec. was 37. Afterwards, slowing occurred, and in 2 hours 30 min. the rate per 10 sec. was 12.	*With physostigma*, none. *After atropia*, in 3 min., the secretion of certain buccal glands was slightly increased, but only for a few minutes; and in 2 hours 15 min. increase again occurred, and continued for at least an hour, the respirations being often noisy. In 40 min., several normal fæcal pellets were passed; in 7 hours, slightly pultaceous fæces; and, afterwards, on several occasions, semi-liquid fæces.	*With physostigma*, none. *After atropia*, in 3 min., slight extension of the limbs, which became well marked in 5 min. In 10 min., distinct paralysis; in 40 minutes, well-marked paralysis; and in 1 hour 30 min., almost no paralysis. Tremors and starts frequently occurred; and fibrillary twitches were very well developed, and present for at least 2 hours 40 min.
	b 3 lbs. 6 oz.	0·135 (= 0·12 gr. p. 3 lbs.)	0	0	Death, in 37 min.	—	—	—	—	—

Number of Experiment.	Weight of Rabbit.	Dose of Physostigma (in Grains). Actual Dose of Sul. of Physostigmia.	Doses of Sulphate of Atropia (in Grains). Actual Dose.	Doses of Sulphate of Atropia (in Grains). Dose p. 3 lbs. of Animal.	Result.	Effect on the Pupils. (The Measurements are in fiftieths of an inch.)	Effect on the Heart.	Effect on the Respirations.	Effect on Secretion and Excretion.	Effects on Motility, &c.
172. *a* [Experiment *b* was performed ten days after experiment *a*.]	3 lbs. 3 oz.	0·127	0·11	0·1	Recovery.	*With physostigma*, none. *After atropia*, the size was in 8 min., $\frac{15}{50} \times \frac{15}{50}$; and in 40 min., $\frac{18}{50} \times \frac{18}{50}$.—On the following day it was $\frac{17}{50} \times \frac{17}{50}$; and on the 7th day, $\frac{15}{50} \times \frac{14}{50}$.	*With physostigma*, none noted. *After atropia*, no accurate observations could be made for more than 1 hour 20 min., on account of the very frequent fibrillary twitches.—On the following day the rate per 10 sec. was 40.	*With physostigma*, none noted. *After atropia*, in 40 min., slowing to 19 per 10 sec. from the original rate of 23 per 10 sec.	*With physostigma*, none. *After atropia*, in 1 min. 30 sec., the secretion of certain buccal glands was slightly increased, but only for a few minutes. In 20 min., pultaceous fæces were passed.	*With physostigma*, none. *After atropia*, in 7 min., slight extension of the limbs, and unsteadiness. In 14 min., slight paralysis, which did not perceptibly increase, but had almost disappeared in 1 hour 30 min. Occasionally, gentle tremors occurred. Fibrillary twitches were very well developed, and lasted for more than 1 hour 30 min.
	3 lbs. 2 oz.	0·125 (= 0·12 gr. p. 3 lbs.)	0	0	Death, in 29 min.	—	—	—	—	—
173. *a* [Experiment *b* was performed nine days after experiment *a*.]	3 lbs.	0·12	0·2	0·2	Recovery.	*With physostigma*, none. *After atropia*, the size was in 2 min., $\frac{15}{50} \times \frac{14}{50}$; and in 9 min., $\frac{17}{50} \times \frac{17}{50}$, which size remained for more than 1 hour.—On the following day, the size was $\frac{13}{50} \times \frac{13}{50}$.	*With physostigma*, in 4 min. 30 sec., slowing from 42 to 32 per 10 sec. *After atropia*, the rate could not accurately be ascertained for more than 1 hour 20 min., on account of the frequent occurrence of fibrillary twitches.—On the following day, the rate per 10 sec. was 32.	*With physostigma*, none. *After atropia*, the rate per 10 sec. was in 3 min., 14; and in 9 min., 23.	*With physostigma*, in 4 min. 30 sec., the secretion of certain buccal glands were slightly increased. *After atropia*, the above increase ceased in a few minutes. Neither defæcation, urination, nor salivation occurred during the 2 hours of continuous observation.	*With physostigma*, in 2 min., infrequent fibrillary twitches. *After atropia*, the fibrillary twitches soon became very well marked, and continued so for at least 1 hour 40 min. In 9 min., slight paralysis, which did not distinctly increase during the succeeding hour and 40 min.
	3 lbs. 3 oz.	0·127 (= 0·12 gr. p. 3 lbs.)	0	0	Death, in 13 min.	—	—	—	—	—
174. *a* [Experiment *b* was performed nine days after experiment *a*.]	3 lbs.	0·12	0·5	0·5	Recovery.	*With physostigma*, in 4 min., dilatation from $\frac{10}{50} \times \frac{9}{50}$ to $\frac{11}{50} \times \frac{10}{50}$. *After atropia*, the size was in 2 min., $\frac{15}{50} \times \frac{15}{50}$; in 5 min., $\frac{16}{50} \times \frac{16}{50}$; in 45 min., $\frac{15}{50} \times \frac{15}{50}$; in 1 hour 10 min., $\frac{10}{50} \times \frac{9}{50}$; and in 2 hours 10 min., $\frac{9}{50} \times \frac{9}{50}$.—On the following day, it was $\frac{9}{50} \times \frac{8}{50}$.	*With physostigma*, in 4 min. 20 sec., acceleration from 40 to 35 per 10 sec. *After atropia*, the rate per 10 sec. was in 4 min., 46; in 7 min., 53; in 11 min., 62; in 45 min., 48; and in 2 hours 10 min., 40—On the following day, it was 40.	*With physostigma*, in 3 min., slowing from 20 to 15 per 10 sec. *After atropia*, the rate per 10 sec. was in 6 min., 26; in 25 min., 18; and in 2 hours 12 min., 14.	*With physostigma*, none noted. *After atropia*, in 1 hour, somewhat pultaceous fæcal pellets were passed. No urination nor salivation occurred during the 2 hours of continuous observation.	*With physostigma*, in 2 min., infrequent fibrillary twitches. *After atropia*, the fibrillary twitches soon became well marked, and they continued for more than 2 hours. In 6 min., some stiffness in the limbs; in 13 min, distinct paralysis, which increased a little and then lessened, so that in 1 hour 30 min., there was almost no paralysis. Occasionally, feeble tremors occurred.
	3 lbs. 3 oz.	0·127 (= 0·12 gr. p. 3 lbs.)	0	0	Death, in 22 min.	—	—	—	—	—

Number of Experiment.	Weight of Rabbit.	Dose of Physostigma (in Grains). Actual Dose of Sul. of Physostigmia.	Doses of Sulphate of Atropia (in Grains). Actual Dose.	Doses of Sulphate of Atropia (in Grains). Dose p. 3 lbs. of Animal.	Result.	Effect on the Pupils. (The Measurements are in fiftieths of an inch.)	Effect on the Heart.	Effect on the Respirations.	Effect on Secretion and Excretion.	Effects on Motility, &c.
175. *a*	3 lbs. 11 oz. [Experiment *b* was performed nine days after experiment *a*.]	0·147	1·2	1	Recovery.	*With physostigma*, none. *After atropia*, the size was in 2 min., $\frac{18}{50} \times \frac{15}{50}$; and this size remained for more than 2 hours.—On the following day, the size was $\frac{12}{50} \times \frac{10}{50}$; on the 3d day, $\frac{16}{50} \times \frac{15}{50}$; and on the 9th day, $\frac{14}{50} \times \frac{14}{50}$.	*With physostigma*, in 4 min., slowing from 41 to 33 per 10 sec. *After atropia*, the rate per 10 sec. was in 5 min., 51; in 30 min., 53; and in 2 hours, 55.—On the following day it was 45; and on the 3d day, 42.	*With physostigma*, in 3 min., slowing from 22 to 19 per 10 sec. *After atropia*, in 30 min., the rate per 10 sec. was 27; and in 1 hour, 15.	*With physostigma*, none. *After atropia*, none. Neither defæcation, urination, nor salivation occurred during the 2 hours of continuous observation.	*With physostigma*, in 2 min., infrequent fibrillary twitches. *After atropia*, the fibrillary twitches became well marked, and continued so for at least 2 hours. In 10 min., slight paralysis; in 25 min., pretty well-marked paralysis; and in 1 hour 20 min., almost no paralysis. Rarely feeble tremors occurred.
b	3 lbs. 11 oz.	0·147 (= 0·12 gr. p. 3 lbs.)	0	0	Death, in 31 min.	—	—	—	—	—
176. *a*	3 lbs. 2½ oz. [Experiment *b* was performed ten days after experiment *a*.]	0·126	2·08	2	Recovery.	*With physostigma*, in 4 min. 20 sec., dilatation from $\frac{13}{50} \times \frac{11}{50}$ to $\frac{13}{50} \times \frac{13}{50}$. *After atropia*, the size was in 4 min., $\frac{14}{50} \times \frac{15}{50}$; in 30 min., $\frac{18}{50} \times \frac{18}{50}$; and in 2 hours 15 min., $\frac{18}{50} \times \frac{18}{50}$.—On the following day, it was $\frac{14}{50} \times \frac{14}{50}$; and on the 9th day, $\frac{12}{50} \times \frac{11}{50}$.	*With physostigma*, in 4 min., slowing from 39 to 36 per 10 sec. *After atropia*, the rate per 10 sec. was in 5 min., 51; in 16 min., 58; in 40 min., 55; in in 1 hour, 46; and in 1 hour 30 min., 34.—On the following day, it was 38; and on the 3d day, 40.	*With physostigma*, in 3 min., slowing from 16 to 15 per 10 sec. *After atropia*, the rate per 10 sec. was in 4 min., 14; in 30 min., 17; and in 1 hour, 14.	*With physostigma*, none. *After atropia*, in 40 min. and in 2 hours 20 min., urine was voided. Neither defæcation nor salivation occurred during the 2 hours 30 min. of continuous observation.	*With physostigma*, in 2 min., infrequent fibrillary twitches. *After atropia*, the fibrillary twitches became well marked, and continued for more than 2 hours 30 min. In 25 min., slight paralysis; in 40 min., well-marked paralysis; and in 2 hours, almost no paralysis. Very gentle tremors occasionally occurred.
b	3 lbs. 2 oz.	0·125 (= 0·12 gr. p. 3 lbs.)	0	0	Death, in 25 min.	—	—	—	—	—
177. *a*	3 lbs. 4 oz. [Experiment *b* was performed three days after experiment *a*.]	0·13	2·6	2·4	Recovery.	*With physostigma*, in 3 min. 30 sec., dilatation from $\frac{13}{50} \times \frac{11}{50}$ to $\frac{13}{50} \times \frac{13}{50}$. *After atropia*, the size was in 4 min., $\frac{17}{50} \times \frac{15}{50}$; and in 1 hour, $\frac{15}{50} \times \frac{15}{50}$.—On the following day, it was $\frac{17}{50} \times \frac{17}{50}$.	*With physostigma*, in 4 min. 30 sec., slowing from 41 to 31 per 10 sec. *After atropia*, the rate per 10 sec. was in 6 min., 58; in 18 min., 60; and in 1 hour, 60.—On the following day, it was 37; on the 3d day, 34; and on the 4th day, 40.	*With physostigma*, the original rate of 31 per 10 sec. was continued. *After atropia*, the rate per 10 sec. was in 6 min., 33; in 15 min., 31; and in 32 min., 20.	*With physostigma*, in 4 min. 40 sec., the secretion of certain buccal glands was slightly increased. *After atropia*, in 35 min., one normal fæcal pellet was passed. Neither urination nor salivation occurred during the 1 hour and 10 min. of continuous observation.	*With physostigma*, in 2 min., infrequent and slight fibrillary twitches. *After atropia*, the fibrillary twitches remained only slightly marked. In 10 min., extension of the limbs; in 11 min., slight paralysis; and in 20 min., pretty well-marked paralysis. Feeble tremors occurred, and there was one opisthotonic convulsion.
b	3 lbs. 1 oz.	0·12	0	0	Death, in 21 min.	—	—	—	—	—

Number of Experiment.	Weight of Rabbit.	Dose of Physostigma (in Grains). Actual Dose of Sul. of Physostigmia.	Doses of Sulphate of Atropia (in Grains). Actual Dose.	Doses of Sulphate of Atropia (in Grains). Dose p. 3 lbs. of Animal.	Result.	Effect on the Pupils. (The Measurements are in fiftieths of an inch.)	Effect on the Heart.	Effect on the Respirations.	Effect on Secretion and Excretion.	Effects on Motility, &c.
178. *a*	3 lbs. [Experiment *b* was performed nine days after experiment *a*.]	0·12	2·5	2·5	Recovery.	*With physostigma*, none noted. *After atropia*, the size was in 1 min., $\frac{12}{50} \times \frac{12}{50}$; and in 3 min., $\frac{15}{50} \times \frac{15}{50}$, which size was present in 2 hours.—On the following day, it was $\frac{15}{50} \times \frac{15}{50}$.	*With physostigma*, in 4 min., slowing from 41 to 37 per 10 sec. *After atropia*, the rate per 10 sec. was in 3 min., 51; in 15 min., 61; and in 2 hours, 57.—On the following day, it was 37; and on the 3d day, 41.	*With physostigma*, in 3 min., slowing from 17 to 13 per 10 sec. *After atropia*, the rate per 10 sec. was in 5 min., 14; in 14 min., 16; in 1 hour 25 min., 18; and in 2 hours, 13.	*With physostigma*, none noted. *After atropia*, in 20 min., some urine was voided. Neither defæcation nor salivation occurred, nor was the secretion of any buccal gland increased during the 2 hours of continuous observation.	*With physostigma*, in 3 min., infrequent and slight fibrillary twitches. *After atropia*, in 8 min., slight paralysis; in 20 min., well-marked paralysis; and in 2 hours, almost no paralysis. Only at 21 min., a few slight tremors occurred. Fibrillary twitches were present in a very slight form.
b	3 lbs.	0·12	0	0	Death, in 20 min.	—	—	—	—	—
179.	4 lbs. 4 oz.	0·18	3·9	2·6	Death, in 37 min. after the administration of physostigma.	*With physostigma*, none. *After atropia*, the size was in 3 min., $\frac{17}{50} \times \frac{17}{50}$; and in 22 min., $\frac{17}{50} \times \frac{17}{50}$.	*With physostigma*, in 4 min. 30 sec., slowing from 40 to 39 per 10 sec. *After atropia*, the rate per 10 sec. was in 4 min., 48. In order to avoid interference with the result of the experiment, no further observation was made.	*With physostigma*, in 2 min., acceleration from 32 to 35 per 10 sec. *After atropia*, the rate per 10 sec. was in 5 min., 33; in 25 min., 20; and in 28 min., 16. Latterly, the respirations were very feeble, and they ultimately became gasping.	*With physostigma*, none noted. *After atropia*, none. Neither defæcation nor urination occurred, nor was the secretion of any buccal gland increased.	*With physostigma*, in 2 min., infrequent and slight fibrillary twitches. *After physostigma*, in 8 min., slight paralysis, which increased until death. Tremors occurred rarely, but excited and somewhat spasmodic movements frequently took place. Fibrillary twitches became well marked and continued so until death.
180.	2 lbs. 11 oz.	0·11	2·4	2·7	Death, in 29 min. after the administration of physostigma.	*With physostigma*, none. The original size was $\frac{14}{50} \times \frac{13}{50}$. *After atropia*, the size was in 1 min. 30 sec., $\frac{14}{50} \times \frac{14}{50}$; in 2 min., $\frac{16}{50} \times \frac{16}{50}$; and in 28 min. 30 sec., $\frac{16}{50} \times \frac{16}{50}$.—After death, it was in 1 min. 30 sec., $\frac{14}{50} \times \frac{14}{50}$; in 2 min., $\frac{13}{50} \times \frac{13}{50}$; in 9 min., $\frac{5}{50} \times \frac{4}{50}$; and in 18 min., $\frac{7}{50} \times \frac{0}{50}$.	*With physostigma*, in 4 min. 30 sec, slowing from 41 to 32 per 10 sec. *After atropia*, the rate per 10 sec. was in 3 min., 46; and in 6 min., 55.	*With physostigma*, none; the original rate was 21 per 10 sec. *After atropia*, the rate per 10 sec. was in 2 min., 23; and in 16 min., 21. In 19 min., infrequent gasps only occurred, and were continued until death.	*With physostigma*, none noted. *After atropia*, none.	*With physostigma*, in 2 min., infrequent and slight fibrillary twitches. *After atropia*, in 8 min., decided paralysis; and in 18 min., general flaccidity, which continued until death, accompanied with feeble spasms. Fibrillary twitches were present in a very slight form.
181.	3 lbs.	0·12	2·8	2·8	Death, in 43 min. after the administration of physostigma.	*With physostigma*, in 2 min., dilatation from $\frac{13}{50} \times \frac{11}{50}$ to $\frac{13}{50} \times \frac{13}{50}$. *After atropia*, the size was in 2 min., $\frac{16}{50} \times \frac{15}{50}$; in 4 min., $\frac{17}{50} \times \frac{15}{50}$; and in 38 min., $\frac{16}{50} \times \frac{17}{50}$.—After death, it was in 2 min., $\frac{14}{50} \times \frac{15}{50}$; in 4 min., $\frac{12}{50} \times \frac{12}{50}$; in 10 min., $\frac{11}{50} \times \frac{10}{50}$; and in 20 min., $\frac{13}{50} \times \frac{13}{50}$.	*With physostigma*, in 4 min. 30 sec., slowing from 32 to 26 per 10 sec. *After atropia*, the rate per 10 sec. was in 3 min., 43; in 28 min., about 68; in 33 min., 58; and in 37 min., 42.	*With physostigma*, in 3 min. 30 sec., acceleration from 26 to 28 per 10 sec. *After atropia*, the rate per 10 sec. was in 3 min., 27; in 22 min., 15; in 26 min., 13; in 33 min., 7; and in 36 min., 1. Afterwards, gasps occurred at irregular intervals until death.	*With physostigma*, none noted. *After atropia*, none. Neither defæcation nor urination occurred, nor was the secretion of any buccal gland increased.	*With physostigma*, in 2 min., infrequent and slight fibrillary twitches. *After atropia*, in 15 min., slight paralysis; and in 21 min., well-marked paralysis, which increased until death. Tremors occasionally took place. Fibrillary twitches became well developed, but they diminished after 24 min.—Rigor began to set in at about 40 min. after death (temp. of laboratory, 61° F.).

Number of Experiment.	Weight of Rabbit.	Dose of Physostigma (in Grains). Actual Dose of Sul. of Physostigmia.	Doses of Sulphate of Atropia (in Grains). Actual Dose.	Doses of Sulphate of Atropia (in Grains). Dose p. 3 lbs. of Animal	Result.	Effect on the Pupils. (The Measurements are in fiftieths of an inch.)	Effect on the Heart.	Effect on the Respirations.	Effect on Secretion and Excretion.	Effects on Motility, &c.
182.	3 lbs. 4 oz.	0·13	3·25	3	Death, in 1 hour and 4 min. after the administration of physostigma.	*With physostigma*, none. The original size was $\frac{13}{50} \times \frac{13}{50}$. *After atropia*, the size was in 2 min., $\frac{15}{50} \times \frac{15}{50}$; in 8 min., $\frac{16}{50} \times \frac{16}{50}$; in 55 min., $\frac{17}{50} \times \frac{17}{50}$; and in 59 min., $\frac{17}{50} \times \frac{17}{50}$.—After death, it was in 1 min., $\frac{19}{50} \times \frac{19}{50}$; in 5 min., $\frac{7}{70} \times \frac{6}{50}$; and in 28 min., $\frac{19}{50} \times \frac{19}{50}$.	*With physostigma*, in 4 min., slowing from 41 to 36 per 10 sec. *After atropia*, the rate per 10 sec. was in 4 min., 53; in 12 min., 61; and in 59 min., 38.	*With physostigma*, in 2 min. 30 sec., acceleration from 20 to 23 per 10 sec. *After atropia*, the rate per 10 sec. was in 6 min., 25; in 48 min., 15; in 52 min., 12; and in 56 min., 2, and gasping.	*With physostigma*, none noted. *After atropia*, in 52 min., a little urine was voided. Neither defæcation nor salivation occurred, nor did any moist sounds accompany the respirations.	*With physostigma*, in 2 min., infrequent and slight fibrillary twitches. *After atropia*, in 22 min., slight paralysis; and in 40 min., well-marked paralysis and some general flaccidity. Occasionally, feeble tremors occurred. Fibrillary twitches were pretty well marked until 25 min., but afterwards they became extremely slight.—Rigor began to set in at about 45 min. after death (temp. of laboratory, 60° F.).
183.	3 lbs.	0·12	3·2	3·2	Death, in 54 min. after the administration of physostigma.	*With physostigma*, none. The original size was $\frac{13}{50} \times \frac{13}{50}$. *After atropia*, the size was in 3 min., $\frac{17}{50} \times \frac{17}{50}$; and it continued so until death.—After death, it was in 2 min., $\frac{15}{50} \times \frac{15}{50}$; in 4 min., $\frac{13}{50} \times \frac{13}{50}$; and in 29 min., $\frac{18}{50} \times \frac{18}{50}$.	*With physostigma*, in 4 min., slowing from 43 to 35 per 10 sec. *After atropia*, the rate per 10 sec. was in 33 min., 52; in 40 min., 50; in 43 min., 48; in 45 min., 39; and in 48 min. 30 sec., 36.	*With physostigma*, in 2 min., slowing from 26 to 16 per 10 sec. *After atropia*, the rate per 10 sec. was in 15 min., 31; in 25 min., 18; in 34 min., 13; in 38 min., 8; and in 42 min., 3. Only feeble gasps afterwards occurred.	*With physostigma*, none noted. *After atropia*, in 1 min., the secretion of certain buccal glands was slightly increased, but only for 2 or 3 min. There was no defæcation, urination, nor salivation.	*With physostigma*, in 1 min. 30 sec., infrequent and slight fibrillary twitches. *After atropia*, the fibrillary twitches increased, but they disappeared at least 15 min. before death. In 11 min., slight paralysis; and in 30 min., general flaccidity. Frequently, tremors and feeble spasms occurred.—After death, there was no rigor in 40 min.; but general rigor was present in 2 hours (temp. of laboratory, 62° F.).
184.	3 lbs. 5 oz.	0·132	4·4	4	Death, in 31 min. after the administration of physostigma.	*With physostigma*, none. The original size was $\frac{14}{50} \times \frac{13}{50}$. *After atropia*, the size was in 5 min., $\frac{17}{50} \times \frac{17}{50}$; and it continued so until death.—After death, the size was in 30 sec., $\frac{14}{50} \times \frac{13}{50}$; in 3 min., $\frac{11}{50} \times \frac{9}{70}$; and in 13 min., $\frac{13}{50} \times \frac{11}{50}$.	*With physostigma*, in 4 min. 30 sec., slowing from 42 to 40 per 10 sec. *After atropia*, the rate per 10 sec. was in 4 min., 62; in 19 min., 58; in 23 min., 57; in 22 min., 52; and in 25 min. 30 sec., 40.	*With physostigma*, in 4 min., slowing from 31 to 25 per 10 sec. *After atropia*, the rate per 10 sec. was in 6 min., 38; in 14 min., 16; in 18 min., 8; and in 20 min., 5.—Afterwards feeble gasps occurred at irregular intervals until death.	*With physostigma*, none noted. *After atropia*, none. There was not any defæcation, urination, or salivation.	*With physostigma*, in 2 min., infrequent and slight fibrillary twitches. *After atropia*, in 6 min., slight paralysis; and in 20 min., general flaccidity. Tremors and starts frequently occurred. Fibrillary twitches became well developed, but they disappeared before death.—Rigor first appeared at 1 hour after death (temp. of laboratory, 61° F.).

TABLE 3.—Experiments with One and a half times the Minimum-Lethal Dose of Physostigma (0·18 *gr. of Sulphate of Physostigmia per Three Pounds Weight of Rabbit*).

Number of Experiment.	Weight of Rabbit	Dose of Physostigma (in Grains). Actual Dose of Sul. of Physostigmia.	Doses of Sulphate of Atropia (in Grains). Actual Dose.	Doses of Sulphate of Atropia (in Grains). Dose p. 3 lbs. of Animal	Result.	Effect on the Pupils. (The Measurements are in fiftieths of an inch.)	Effect on the Heart.	Effect on the Respirations.	Effect on Secretion and Excretion.	Effects on Motility, &c.
185.	3 lbs. 2 oz.	0·187	0·03	0·03	Death, in 25 min. after the administration of physostigma.	*With physostigma*, none. The original size was $\frac{11}{50} \times \frac{12}{50}$. *After atropia*, the size was in 13 min., $\frac{9}{50} \times \frac{8}{50}$; and in 18 min., $\frac{8}{50} \times \frac{7}{50}$. —After death, the size was in 1 min., $\frac{6}{50} \times \frac{6}{50}$; in 2 min., $\frac{5}{50} \times \frac{5}{50}$; and in 22 min., $\frac{6}{50} \times \frac{5}{50}$.	*With physostigma*, none noted. *After atropia*, no observations were made.	*With physostigma*, none noted. *After atropia*, in 13 min., the respirations were laboured and impeded by mucus and saliva. In 11 min., gasps only occurred.	*With physostigma*, none. *After atropia*, in 12 min., slight salivation occurred, and continued until death; and in 13 min., the secretion of other buccal glands was increased. No defæcation nor urination occurred.	*With physostigma*, in 2 min., infrequent and slight fibrillary twitches. *After atropia*, in 8 min., distinct paralysis; and in 16 min., general flaccidity, which continued until death, accompanied with feeble tremors and starts. —Rigor began to set in at about 42 min. after death.
186. *a*	3 lbs. 4 oz. [Experiment *b* was performed fifteen days after experiment *a*.]	0·19	0·054	0·05	Recovery.	*With physostigma*, none. The original size was $\frac{14}{50} \times \frac{13}{50}$. *After atropia*, the size was in 1 min. 30 sec., $\frac{15}{50} \times \frac{15}{50}$; in 4 min., $\frac{13}{50} \times \frac{13}{50}$; in 11 min., $\frac{12}{50} \times \frac{12}{50}$; and in 1 hour 6 min., $\frac{12}{50} \times \frac{12}{50}$. — On the following day, the size was $\frac{18}{50} \times \frac{17}{50}$; on the 3d day, $\frac{16}{50} \times \frac{16}{50}$; and on the 7th day, $\frac{15}{50} \times \frac{15}{50}$.	*With physostigma*, in 3 min., slowing from 39 to 31 per 10 sec. *After atropia*, the rate per 10 sec. was in 3 min., 49. Afterwards, the rate could not be accurately ascertained, on account of frequent fibrillary twitches.—On the following day, it was 34; and on the 3d day, 41.	*With physostigma*, in 3 min. 30 sec., slowing from 35 to 28 per 10 sec. *After atropia*, the rate per 10 sec. was in 11 min., 26; and in 18 min., 28.	*With physostigma*, none noted. *After atropia*, in 2 min., slight increase in the secretion of certain buccal glands, which ceased in about 7 min. No defæcation, urination, nor salivation occurred during the 1 hour and 10 min. of continuous observation.	*With physostigma*, none noted. *After atropia*, in 1 min. 30 sec., extension of the limbs; in 18 min., slight paralysis; and in 1 hour, decided, though not severe, paralysis. No tremors nor spasms occurred. Fibrillary twitches were present in a very well-marked form for more than 1 hour.
b	3 lbs. 8 oz.	0·14 (= 0·12 gr. p. 3 lbs.)	0	0	Death, in 19 min.	—	—	—	—	—
187. *a*	3 lbs. 1 oz. [Experiment *b* was performed eleven days after experiment *a*.]	0·183	0·1	0·1	Recovery.	*With physostigma*, none. The original size was $\frac{13}{50} \times \frac{13}{50}$. *After atropia*, the size was in 3 min., $\frac{15}{50} \times \frac{15}{50}$; in 12 min., $\frac{13}{50} \times \frac{13}{50}$; and in 55 min., $\frac{12}{50} \times \frac{12}{50}$.—On the following day, it was $\frac{15}{50} \times \frac{14}{50}$.	*With physostigma*, in 4 min., slowing from 37 to 32 per 10 sec. *After atropia*, the rate per 10 sec. was in 3 min., 49; and in 5 min., 61. Afterwards, the rate could not be ascertained on account of the frequent fibrillary twitches.—On the following day, it was 35.	*With physostigma*, in 3 min. 20 sec., slowing from 24 to 16 per 10 sec. *After atropia*, none noted.	*With physostigma*, none. *After atropia*, in 2 min., slight increase in the secretion of certain buccal glands. There was no defæcation, urination, nor salivation, during the 1 hour and 15 min. of continuous observation.	*With physostigma*, in 2 min., infrequent and slight fibrillary twitches. *After atropia*, the fibrillary twitches soon became very well marked, and continued so for at least 1 hour 10 min. In 8 min., slight paralysis; and in 36 min., well-marked paralysis, which had not perceptibly lessened in 1 hour 15 min. Tremors frequently occurred, and on two occasions feeble general spasms took place.
b	3 lbs. 2 oz.	0·125 (= 0·12 gr. p. 3 lbs.)	0	0	Death, in 17 min.	—	—	—	—	—

Number of Experiment.	Weight of Rabbit.	Dose of Physostigma (in Grains). Actual Dose of Sul. of Physostigmia.	Doses of Sulphate of Atropia (in Grains). Actual Dose.	Doses of Sulphate of Atropia (in Grains). Dose p. 3 lbs. of Animal.	Result.	Effect on the Pupils. (The Measurements are in fiftieths of an inch.)	Effect on the Heart.	Effect on the Respirations.	Effect on Secretion and Excretion.	Effects on Motility, &c.
188. *a*	3 lbs. [Experiment *b* was performed eleven days after experiment *a*.]	0·18	0·2	0·2	Recovery.	*With physostigma*, none. The original size was $\frac{12}{50} \times \frac{11}{50}$. *After atropia*, the size was in 2 min., $\frac{15}{50} \times \frac{15}{50}$; in 7 min., $\frac{18}{50} \times \frac{18}{50}$; in 25 min., $\frac{15}{50} \times \frac{15}{50}$; in 50 min., $\frac{14}{50} \times \frac{14}{50}$; and in 1 hour 50 min., $\frac{12}{50} \times \frac{11}{50}$. —On the following day, it was $\frac{14}{50} \times \frac{13}{50}$.	*With physostigma*, in 4 min. 50 sec., slowing from 41 to 34 per 10 sec. *With atropia*, the rate per 10 sec. was in 5 min., 51; in 11 min., 55; and in 1 hour 50 min., 37.—On the following day, it was 45.	*With physostigma*, none. The original rate was 26 per 10 sec. *With atropia*, the rate per 10 sec. was in 6 min., 24; in 30 min., 20; and in 1 hour 52 min., 18. From 30 min. to 1 hour 18 min., the respirations were considerably impeded by fluid in the fauces and larynx.	*With physostigma*, none noted. *With atropia*, in 3 min., slight increase in the secretion of certain buccal glands, which gradually increased, but which had quite ceased in one hour 20 min. Salivation occurred at 26 min.; and urine was voided at 46 min., and also at 1 hour 18 min. No defæcation occurred during 1 hour and 54 min.	*With physostigma*, in 1 min. 30 sec., infrequent and slight fibrillary twitches. *With atropia*, the fibrillary twitches became well marked, and continued so for at least 1 hour 50 min. In 12 min., distinct paralysis; in 30 min., well-marked paralysis; and in 50 min., only slight paralysis. No distinct tremors occurred.
b	3 lbs.	0·12	0	0	Death, in 24 min.	—	—	—	—	—
189. *a*	3lbs. 14½ oz. [Experiment *b* was performed ten days after experiment *a*.]	0·23	0·39	0·3	Recovery.	*With physostigma*, none. The original size was $\frac{15}{50} \times \frac{15}{50}$. *After atropia*, the size was in 4 min., $\frac{12}{50} \times \frac{12}{50}$; and this size was not changed in 2 hours 40 min.—On the following day, it was $\frac{13}{50} \times \frac{13}{50}$; and on the 8th day, $\frac{17}{50} \times \frac{17}{50}$.	*With physostigma*, in 4 min. 30 sec., slowing from 44 to 33 per 10 sec. *After atropia*, the rate per 10 sec. was in 5 min., 58; in 1 hour 57; in 1 hour 40 min., 54; and in 2 hours 40 min., 53.—On the following day, the rate per 10 sec. was 37; and on the 3d day, 41.	*With physostigma*, in 4 min., slowing from 35 to 24 per 10 sec. *After atropia*, the rate per 10 sec. was in 35 min, 16; in 1 hour, 26; in 1 hour 40 min., 40; and in 2 hours 40 min., 34.—On the following day the rate per 10 sec. was 17.	*With physostigma*, none. *After atropia*, in 2 min., slight increase in the secretion of certain buccal glands, which ceased in a few minutes. There was no defæcation, urination, nor salivation during the 2 hours and 45 min. of continuous observation.	*With physostigma*, in 2 min., infrequent and slight fibrillary twitches. *After atropia*, the fibrillary twitches became very well marked, and continued so for more than 2 hours 30 min. In 6 min., slight paralysis; in 25 min., well-marked paralysis; and in 1 hour 30 min., only slight paralysis. Tremors frequently occurred, but there were no spasms.
b	4 lbs.	0·16 (= 0.12 gr. p. 3 lbs.)	0	0	Death, in 22 min. 30 sec.	—	—	—	—	—
190. *a*	3 lbs. 3 oz. [Experiment *b* was performed nine days after experiment *a*.]	0·19	0·42	0·4	Recovery.	*With physostigma*, none. The original size was $\frac{13}{50} \times \frac{13}{50}$. *After atropia*, the size was in 6 min., $\frac{16}{50} \times \frac{16}{50}$; in 8 min., $\frac{18}{50} \times \frac{18}{50}$; in 42 min., $\frac{18}{50} \times \frac{16}{50}$; in 1 hour 8 min., $\frac{15}{50} \times \frac{15}{50}$; and in 1 hour 16 min., $\frac{15}{50} \times \frac{15}{50}$.—On the following day, it was $\frac{13}{50} \times \frac{12}{50}$.	*With physostigma*, in 4 min. 30 sec., slowing from 41 to 37 per 10 sec. *After atropia*, the rate per 10 sec. was in 1 hour 8 min., 57.—On the following day, it was 35.	*With physostigma*, none noted. The original rate was 32 per 10 sec. *After atropia*, the rate per 10 sec. was in 15 min., 28; in 32 min., 27; and in 1 hour, 22.	*With physostigma*, none. *After atropia*, in 55 min., and in 1 hour 8 min., urine was voided. There was neither defæcation nor increase in the secretion of any buccal gland during the 1 hour and 10 min. of continuous observation.	*With physostigma*, in 2 min., infrequent and slight fibrillary twitches. *After atropia*, the fibrillary twitches became very well marked, and continued so for at least 1 hour and 20 min. In 25 min., slight paralysis; in 45 min., well-marked paralysis; and in 1 hour, almost no paralysis. Only slight tremors occurred.
b	3 lbs.	0·12	0	0	Death, in 23 min.	—	—	—	—	—

Number of Experiment.		Weight of Rabbit.	Dose of Physostigma (in Grains). Actual Dose of Sul. of Physostigmia.	Doses of Sulphate of Atropia (in Grains). Actual Dose.	Doses of Sulphate of Atropia (in Grains). Dose p. 3 lbs. of Animal.	Result.	Effect on the Pupils. (The Measurements are in fiftieths of an inch.)	Effect on the Heart.	Effect on the Respirations.	Effect on Secretion and Excretion.	Effects on Motility, &c.
191.	*a*	2 lbs. 12 oz. [Experiment *b* was performed nine days after experiment *a*.]	0·16	0·45	0·5	Recovery.	*With physostigma*, none. The original size was $\frac{12}{50} \times \frac{11}{50}$. *After atropia*, the size was in 2 min., $\frac{15}{50} \times \frac{15}{50}$; in 8 min., $\frac{16}{50} \times \frac{16}{50}$; in 1 hour, $\frac{15}{50} \times \frac{15}{50}$; and in 1 hour 15 min, $\frac{12}{50} \times \frac{11}{50}$.—On the following day, it was $\frac{12}{50} \times \frac{11}{50}$.	*With physostigma*, in 24 min. 30 sec., slowing from 35 to 26 per 10 sec. *After atropia*, the rate per 10 sec. was in 2 min. 30 sec., 38; in 5 min., 40; and in 10 min., 48.—On the following day, it was 24.	*With physostigma*, in 3 min., slowing from 19 to 13 per 10 sec. *After atropia*, the rate per 10 sec. was in 3 min., 12; and in 10 min., 16.	*With physostigma*, none. *After atropia*, in 3 min., slight increase in the secretion of certain buccal glands, which ceased in a few min. In 1 hour 5 min., several wet fæcal pellets were passed; and in 1 hour 10 min., urine was voided. There was not any salivation.	*With physostigma*, in 2 min., infrequent and slight fibrillary twitches. *After atropia*, the fibrillary twitches soon became well marked, and continued so for at least 1 hour 15 min. In 8 min., slight paralysis; in 35 min., well-marked paralysis; and in 1 hour 15 min., only slight paralysis. Tremors occurred, and twice there were feeble general spasms.
	b	2 lbs. 15 oz.	0·12	0	0	Death, in 25 min.	—	—	—	—	—
192.	*a*	3 lbs. 3 oz. [Experiment *b* was performed thirteen days after experiment *a*.]	0·19	0·74	0·7	Recovery.	*With physostigma*, none. The original size was $\frac{11}{50} \times \frac{10}{50}$. *After atropia*, the size was in 5 min., $\frac{15}{50} \times \frac{15}{50}$; in 38 min., $\frac{11}{50} \times \frac{12}{50}$; and in 2 hours 10 min., $\frac{11}{50} \times \frac{10}{50}$.—On the following day, it was $\frac{14}{50} \times \frac{13}{50}$; and on the 5th day, $\frac{13}{50} \times \frac{12}{50}$.	*With physostigma*, in 4 min., slowing from 41 to 30 per 10 sec. *After atropia*, the rate per 10 sec. was not counted until 2 hours 8 min., when it was 50.—On the following day, it was 51; and on the 3d day, 40.	*With physostigma*, in 2 min. 30 sec., slowing from 20 to 18 per 10 sec. *After atropia*, the rate per 10 sec. was not counted until 2 hours, when it was 11. In 2 min., the respirations were often accompanied with moist sounds; in 4 min., constantly so accompanied; and in 20 min., they ceased to be so accompanied.	*With physostigma*, none. *After atropia*, in 1 min., the secretion of certain buccal glands was increased, and this increase continued for about 20 min., but no salivation occurred. In 18 min., a few normal fæcal pellets were passed. No urine was voided during the 2 hours 25 min. of continuous observation.	*With physostigma*, in 1 min. 30 sec., infrequent and slight fibrillary twitches. *After atropia*, the fibrillary twitches soon became well-marked, and continued so for at least 2 hours. In 3 min., slight paralysis; in 18 min., well-marked paralysis; and in 1 hour 20 min., almost no paralysis. Frequently tremors occurred, and on several occasions weak general convulsions took place.
	b	3 lbs. 3 oz.	0·128 (= 0·12 gr. p. 3 lbs.)	0	0	Death, in 22 min.	—	—	—	—	—
193.	*a*	2 lbs. 15 oz. [Experiment *b* was performed thirteen days after experiment *a*.]	0·176	1·18	1·2	Recovery.	*With physostigma*, none. The original size was $\frac{14}{50} \times \frac{13}{50}$. *After atropia*, the size was in 5 min., $\frac{17}{50} \times \frac{17}{50}$.—On the following day, it was $\frac{18}{50} \times \frac{18}{50}$.	*With physostigma*, in 4 min. 30 sec., slowing from 41 to 33 per 10 sec. *After atropia*, the rate per 10 sec. was in 4 min., 54.—On the following day, it was 44.	*With physostigma*, in 3 min., slowing from 12 to 11 per 10 sec. *After atropia*, none noted.	*With physostigma*, none. *After atropia*, in 9 min., slight increase in the secretion of certain buccal glands, which soon ceased. In 43 min., and in 1 hour 17 min., urine was voided. Neither defæcation nor salivation occurred within 1 hour 30 min.	*With physostigma*, in 1 min. 30 sec., infrequent and slight fibrillary twitches. *After atropia*, the fibrillary twitches soon became well marked, but they had greatly lessened in 1 hour 20 min. In 9 min., slight extension of limbs; in 40 min., distinct paralysis; and in 2 hours 10 min., almost no paralysis. Occasionally tremors took place.
	b	3 lbs.	0·12	0	0	Death, in more than 1 and less than 2 days.	—	—	—	—	—

Number of Experiment.	Weight of Rabbit.	Dose of Physostigma (in Grains). Actual Dose of Sul. of Physostigmia.	Doses of Sulphate of Atropia (in Grains). Actual Dose.	Doses of Sulphate of Atropia (in Grains). Dose p. 3 lbs. of Animal.	Result.	Effect on the Pupils. (The Measurements are in fiftieths of an inch.)	Effect on the Heart.	Effect on the Respirations.	Effect on Secretion and Excretion.	Effects on Motility, &c.
194. *a* [Experiment *b* was performed sixteen days after experiment *a*.]	4 lbs. 9 oz.	0·27	2·2	1·5	Recovery.	*With physostigma*, none. The original size was $\frac{13}{50} \times \frac{11}{50}$. *After atropia*, the size was in 4 min., $\frac{15}{50} \times \frac{15}{50}$; in 10 min., $\frac{17}{50} \times \frac{17}{50}$; and in 2 hours, $\frac{17}{50} \times \frac{17}{50}$.—On the following day, it was $\frac{17}{50} \times \frac{17}{50}$; and on the 12th day, $\frac{10}{50} \times \frac{9}{50}$.	*With physostigma*, in 4 min. 30 sec., slowing from 42 to 34 per 10 sec. *After atropia*, the rate per 10 sec. was in 1 min. 30 sec., 44; and in 4 min., 58.—On the following day, it was 55; on the 3d day, 44; and on the 4th day, 41.	*With physostigma*, none. The original rate was 44 per 10 sec. *After atropia*, the rate per 10 sec. was in 20 min., 42; and in 55 min., 43.—On the following day, it was 40.	*With physostigma*, none. *After atropia*, none. Neither defæcation nor urination occurred, nor was there any salivation during the 2 hours of continuous observation.	*With physostigma*, in 2 min., infrequent and slight fibrillary twitches. *After atropia*, the fibrillary twitches became well marked, and continued so for at least 2 hours. In 11 min., slight paralysis; which increased somewhat until 1 hour, and afterwards lessened, so that in 2 hours there was almost no paralysis. Starts occurred after the first 1 hour, and continued during about 40 min.
b	4 lbs. 4 oz.	0·17 (= 0·12 gr. p. 3 lbs.)	0	0	Death, in 1 hour 10 min.	—	—	—	—	—
195. *a* [Experiment *b* was performed twelve days after experiment *a*.]	3 lbs. 9 oz.	0·21	2·37	2	Recovery.	*With physostigma*, none. The original size was $\frac{14}{50} \times \frac{13}{50}$. *After atropia*, the size was in 2 min., $\frac{18}{50} \times \frac{18}{50}$; and in 1 hour 40 min., $\frac{17}{50} \times \frac{17}{50}$.—On the following day, it was $\frac{17}{50} \times \frac{17}{50}$; and on the 11th day, $\frac{14}{50} \times \frac{13}{50}$.	*With physostigma*, in 4 min. 30 sec., slowing from 31 to 20 per 10 sec. *After atropia*, the rate per 10 sec. was in 5 min., 56; in 10 min., 62; and in 1 hour 25 min., 57.—On the following day, it was 29; on the 3d day, 30; and on the 11th day, 40.	*With physostigma*, none. The original rate was 18 per 10 sec. *After atropia*, the rate per 10 sec. was in 20 min., 20; in 30 min., 19; in 40 min., 11; and in 1 hour, 16.	*With physostigma*, none. *After atropia*, in 2 min., the secretion of certain buccal glands was slightly increased, but this increase ceased in a few min. In 38 min., urine was freely voided. Neither defæcation nor salivation occurred during the 1 hour and 40 min. of continuous observation.	*With physostigma*, in 2 min., infrequent and slight fibrillary twitches. *After atropia*, the fibrillary twitches soon became well marked, but continued so for only 25 min., and they were very slight and infrequent in 40 min. In 10 min., slight paralysis; in 40 min., well-marked paralysis; and in 1 hour 40 min., distinct but considerably lessened paralysis. Tremors and feeble general spasms occasionally took place.
b	3 lbs. 13 oz.	0·15 (= 0·12 gr. p. 3 lbs.)	0	0	Death, in 16 min.	—	—	—	—	—
196. *a* [Experiment *b* was performed four days after experiment *a*.]	2 lbs. 10 oz.	0·157	1·84	2·1	Recovery.	*With physostigma*, none. The original size was $\frac{11}{50} \times \frac{10}{50}$. *After atropia*, the size was in 8 min., $\frac{15}{50} \times \frac{14}{50}$; and in 3 hours, $\frac{15}{50} \times \frac{15}{50}$.—On the following day, it was $\frac{16}{50} \times \frac{16}{50}$.	*With physostigma*, in 4 min. 30 sec., slowing from 42 to 34 per 10 sec. *After atropia*, the rate per 10 sec. was in 3 min., 52; in 6 min., 58; in 17 min., 53; in 55 min., 49; and in 3 hours, 55.—On the following day, it was 34; and on the 3d day, 39.	*With physostigma*, none. The original rate was 22 per 10 sec. *After atropia*, the rate per 10 sec. was in 4 min., 29; in 17 min., 34; in 30 min., 29; and in 3 hours, 21.	*With physostigma*, in 4 min. 40 sec., slight increase in the secretion of certain buccal glands. *After atropia*, none. There was no defæcation, urination, nor salivation during the 3 hours of continuous observation.	*With physostigma*, in 2 min., infrequent and slight fibrillary twitches. *After atropia*, the fibrillary twitches soon became well marked, but they again became slight in 3 hours. In 7 min., there was some extension of the limbs; in 10 min., distinct paralysis; in 30 min., pretty well-marked paralysis; and in 3 hours, slight paralysis. Occasionally, very feeble tremors occurred.
b	2 lbs. 7 oz.	0·097 (= 0·12 gr. p. 3 lbs.)	0	0	Death, in 22 min.	—	—	—	—	—

Number of Experiment.	Weight of Rabbit.	Dose of Physostigma (in Grains). Actual Dose of Sul. of Physostigmia.	Doses of Sulphate of Atropia (in Grains). Actual Dose.	Doses of Sulphate of Atropia (in Grains). Dose p. 3 lbs. of Animal.	Result.	Effect on the Pupils. (The Measurements are in fiftieths of an inch.)	Effect on the Heart.	Effect on the Respirations.	Effect on Secretion and Excretion.	Effects on Motility, &c.
197. *a*	2 lbs. 15 oz. [Experiment *b* was performed seven days after experiment *a*.]	0·17	2·05	2·1	Recovery.	*With physostigma*, in 4 min., dilatation from $\frac{11}{50} \times \frac{10}{50}$ to $\frac{12}{50} \times \frac{11}{50}$. *After atropia*, the size was in 5 min., $\frac{17}{50} \times \frac{17}{50}$; and in 1 hour 15 min., $\frac{18}{50} \times \frac{18}{50}$.—On the following day, it was $\frac{18}{50} \times \frac{18}{50}$; on the 4th day, $\frac{14}{50} \times \frac{13}{50}$; and on the 5th day, $\frac{11}{50} \times \frac{10}{50}$.	*With physostigma*, in 4 min. 30 sec., slowing from 36 to 29 per 10 sec. *After atropia*, the rate per 10 sec. was in 3 min., 51; in 7 min., 63; and in 1 hour 26 min., 62.—On the following day, it was 27; and on the 4th day, 43.	*With physostigma*, none. The original rate was 11 per 10 sec. *After atropia*, the rate per 10 sec. was in 3 min., 9; in 4 min., 11; in 10 min., 16; in 30 min., 13; and in 1 hour 14 min., 10.	*With physostigma*, in 3 min., slight increase in the secretion of certain buccal glands. *After atropia*, none. There was no defæcation, urination, nor salivation during the 1 hour 30 min. of continuous observation.	*With physostigma*, in 2 min., infrequent and slight fibrillary twitches. *After atropia*, the fibrillary twitches soon became pretty well marked, but they again became very slight after 20 min. In 10 min., distinct paralysis; in 35 min., well-marked and advanced paralysis; and in 1 hour 30 min., pretty well-marked paralysis. Occasionally tremors and feeble convulsions took place.
b	2 lbs. 15 oz.	0·117 (= 0·12 gr. p. 3 lbs.)	0	0	Death, in 30 min.	—	—	—	—	—
198. *a*	3 lbs. 8 oz. [Experiment *b* was performed eight days after experiment *a*.]	0·21	2·5	2·2	Recovery.	*With physostigma*, none. The original size was $\frac{14}{50} \times \frac{13}{50}$. *After atropia*, the size was in 5 min., $\frac{17}{50} \times \frac{17}{50}$; and in 1 hour 20 min., $\frac{18}{50} \times \frac{18}{50}$.—On the following day, it was $\frac{20}{50} \times \frac{20}{50}$.	*With physostigma*, in 4 min. 30 sec., slowing from 42 to 31 per 10 sec. *After atropia*, the rate per 10 sec. was in 12 min., 49; in 40 min., 42; and in 1 hour 15 min., 35.—On the following day, it was 26; and on the 3d day, 39.	*With physostigma*, none. The original rate was 15 per 10 sec. *After atropia*, the rate per 10 sec. was in 12 min., 24; in 40 min., 12; in 50 min., 10; and in 1 hour 20 min., 12.—On the following day, it was 11.	*With physostigma*, none. *After atropia*, none. There was no defæcation, urination, nor salivation during the 1 hour and 30 min. of continuous observation.	*With physostigma*, in 2 min., infrequent and slight fibrillary twitches. *After atropia*, the fibrillary twitches were pretty well marked for 35 min., but afterwards they were only slight. In 10 min., distinct paralysis; and in 20 min., pretty well-marked paralysis, which had not lessened much in 1 hour 20 min. Occasionally feeble tremors occurred.
b	3 lbs. 7 oz.	0·14 (= 0.12 gr. p. 3 lbs.)	0	0	Death, in 19 min.	—	—	—	—	—
199.	2 lbs. 14 oz.	0·17	2·1	2·2	Death, in 22 min. after the administration of physostigma.	*With physostigma*, in 3 min. 30 sec., dilatation from $\frac{13}{50} \times \frac{12}{50}$ to $\frac{14}{50} \times \frac{13}{50}$. *After atropia*, the size was in 2 min., $\frac{17}{50} \times \frac{17}{50}$; and in 16 min. 30 sec., $\frac{18}{50} \times \frac{18}{50}$.—After death, it was in 2 min., $\frac{14}{50} \times \frac{14}{50}$; in 14 min., $\frac{11}{50} \times \frac{10}{50}$; in 16 min., $\frac{13}{50} \times \frac{13}{50}$; and in 50 min., $\frac{14}{50} \times \frac{13}{50}$.	*With physostigma*, in 4 min. 30 sec., slowing from 38 to 29 per 10 sec. *After atropia*, the rate per 10 sec. was in 4 min., 57; and in 12 min., 68.	*With physostigma*, in 3 min., slowing from 13 to 10 per 10 sec. *After atropia*, the rate per 10 sec. was in 5 min., 15. In 13 min., infrequent gasps occurred, and continued until death.	*With physostigma*, none. *After atropia*, in 1 min., slight increase took place in the secretion of certain buccal glands, which ceased in a few minutes. There was not any defæcation, urination, or salivation.	*With physostigma*, in 2 min., infrequent and slight fibrillary twitches. *After atropia*, the fibrillary twitches became pretty well marked, but had nearly ceased in 15 min. In 10 min., distinct paralysis; and in 14 min., well-marked paralysis. Tremors and spasms occurred. —Rigor began to set in at 1 hour 16 min. after death (temp. of laboratory, 64° F.).

Number of Experiment.	Weight of Rabbit.	Dose of Physostigma (in Grains). Actual Dose of Sul. of Physostigmia.	Doses of Sulphate of Atropia (in Grains). Actual Dose.	Doses of Sulphate of Atropia (in Grains). Dose p. 3 lbs. of Animal.	Result.	Effect on the Pupils. (The Measurements are in fiftieths of an inch.)	Effect on the Heart.	Effect on the Respirations.	Effect on Secretion and Excretion.	Effects on Motility, &c.
200.	3 lbs. 5 oz.	0·19	2·5	2·3	Death, in 1 hour 1 min. after the administration of physostigma.	*With physostigma*, in 3 min., dilatation from $\frac{14}{50} \times \frac{13}{50}$ to $\frac{15}{50} \times \frac{15}{50}$. *After atropia*, the size was in 3 min., $\frac{12}{50} \times \frac{12}{50}$; and this size remained until death.—After death, the size was in 5 min., $\frac{18}{50} \times \frac{18}{50}$; in 9 min., $\frac{15}{50} \times \frac{15}{50}$; in 24 min., $\frac{13}{50} \times \frac{13}{50}$; in 37 min., $\frac{14}{50} \times \frac{14}{50}$; and in 55 min., $\frac{15}{50} \times \frac{15}{50}$.	*With physostigma*, in 4 min. 20 sec., slowing from 40 to 31 per 10 sec. *After atropia*, the rate per 10 sec. was in 2 min., 54; in 30 min., 38; in 40 min., 37; in 50 min., 27; and in 55 min., 24.	*With physostigma*, in 3 min. 30 sec., acceleration from 18 to 20 per 10 sec. *After atropia*, the rate per 10 sec. was in 6 min., 23; in 25 min., 18; in 38 min., 8; and in 47 min., 6. The respirations were now very shallow and non-rhythmical, and they continued so until death.	*With physostigma*, none. *After atropia*, in 38 min., urine was voided. There was no defæcation, salivation, nor evidence of increase in the secretion of any buccal gland.	*With physostigma*, in 1 min. 30 sec., infrequent and slight fibrillary twitches. *After atropia*, the twitches became pretty well marked, but soon they were only slight, and they disappeared before death. In 14 min., distinct paralysis; and in 40 min., general flaccidity, which continued until death. Frequently weak tremors and starts occurred.—Rigor first began to set in at 1 hour 5 min. after death (temp. of laboratory, 58° F.).
201.	3 lbs. 2 oz.	0·187	2·5	2·4	Death, in 48 min. after the administration of physostigma.	*With physostigma*, none. The original size was $\frac{15}{50} \times \frac{15}{50}$. *After atropia*, the size was in 3 min., $\frac{17}{50} \times \frac{17}{50}$; and in 42 min. 30 sec., $\frac{17}{50} \times \frac{17}{50}$.—After death, it was in 2 min., $\frac{18}{50} \times \frac{18}{50}$; in 9 min., $\frac{11}{50} \times \frac{11}{50}$; and in 50 min., $\frac{12}{50} \times \frac{12}{50}$.	*With physostigma*, in 4 min. 30 sec., slowing from 43 to 30 per 10 sec. *After atropia*, the rate per 10 sec. was in 2 min., 53; in 20 min., 63; and in 42 min., 58.	*With physostigma*, in 3 min., acceleration from 23 to 26 per 10 sec. *After atropia*, the rate per 10 sec. was in 3 min., 26; in 11 min., 36; in 27 min., 20; and in 37 min., 8. Afterwards, mere gasps occurred infrequently until death.	*With physostigma*, none. *After atropia*, in 37 min., urine was voided. There was neither defæcation nor salivation.	*With physostigma*, in 1 min. 20 sec., infrequent and slight fibrillary twitches. *After atropia*, the fibrillary twitches became pretty well marked, but they altogether ceased in 19 min. In 9 min., slight paralysis; and in 30 min., general flaccidity. Frequently weak tremors and starts occurred.—Rigor first began to set in at 25 min. after death (temp. of laboratory, 61° F.).
202.	2 lbs. 15 oz.	0·176	2·35	2·4	Death, in 54 min. after the administration of physostigma.	*With physostigma*, none. The original size was $\frac{10}{50} \times \frac{9}{50}$. *After atropia*, the size was in 1 min. 30 sec., $\frac{14}{50} \times \frac{14}{50}$; in 3 min., $\frac{15}{50} \times \frac{15}{50}$; and in 44 min., $\frac{15}{50} \times \frac{14}{50}$.—After death, it was in 2 min., $\frac{14}{50} \times \frac{14}{50}$; in 7 min., $\frac{13}{50} \times \frac{13}{50}$; and in 1 hour 6 min., $\frac{13}{50} \times \frac{13}{50}$.	*With physostigma*, in 4 min. 30 sec., slowing from 42 to 31 per 10 sec. *After atropia*, the rate per 10 sec. was in 2 min., 49; in 16 min., 60; in 25 min., 54; in 33 min., 37; and in 47 min., 20 (feeble).	*With physostigma*, none. The original rate was 36 per 10 sec. *After atropia*, the rate per 10 sec. was in 3 min., 39; in 15 min., 33; in 24 min., 13; and in 29 min., 4. Afterwards, only feeble gasps occurred irregularly until death.	*With phyostigma*, none. *After atropia*, none. There was no defæcation, urination, nor salivation.	*With physostigma*, in 1 min. 30 sec., infrequent and slight fibrillary twitches. *After atropia*, the fibrillary twitches soon became well-marked, but they altogether ceased before death. In 16 min., slight paralysis; and in 23 min., general flaccidity. Frequently, tremors and weak spasms occurred.—There was no appearance of rigor at 1 hour 6 min. after death (temp. of laboratory, 61° F.).

Number of Experiment.	Weight of Rabbit.	Dose of Physostigma (in Grains). Actual Dose of Sul. of Physostigmia.	Doses of Sulphate of Atropia (in Grains). Actual Dose.	Doses of Sulphate of Atropia (in Grains). Dose p. 3 lbs. of Animal.	Result.	Effect on the Pupils. (The Measurements are in fiftieths of an inch.)	Effect on the Heart.	Effect on the Respirations.	Effect on Secretion and Excretion.	Effects on Motility, &c.
203.	3 lbs.	0·18	2·5	2·5	Death, in 1 hour 14 min. after the administration of physostigma.	*With physostigma*, none. The original size was $\frac{13}{50} \times \frac{11}{50}$. *After atropia*, the size was in 2 min., $\frac{17}{50} \times \frac{17}{50}$; in 8 min., $\frac{18}{50} \times \frac{18}{50}$; in 1 hour 3 min., $\frac{19}{50} \times \frac{19}{50}$; and in 1 hour 8 min., $\frac{19}{50} \times \frac{19}{50}$. — After death, it was in 1 min., $\frac{16}{50} \times \frac{16}{50}$; in 3 min., $\frac{14}{50} \times \frac{14}{50}$; and in 11 min., $\frac{10}{50} \times \frac{9}{50}$.	*With physostigma*, in 4 min., slowing from 44 to 38 per 10 sec. *After atropia*, the rate per 10 sec. was in 5 min., 53; in 50 min., 46; in 1 hour, 37; and in 1 hour 7 min., 23.	*With physostigma*, none. The original rate was 26 per 10 sec. *After atropia*, the rate per 10 sec. was in 12 min., 38; in 26 min., 23; in 34 min., 15; in 49 min., 12; and in 1 hour, 4. Afterwards, mere gasps occurred infrequently and irregularly until death.	*With physostigma*, none. *After atropia*, none. There was no defæcation, urination, nor salivation; nor any evidence of increase in the secretion of any buccal gland.	*With physostigma*, in 2 min., infrequent and slight fibrillary twitches. *After atropia*, the fibrillary twitches became pretty well marked, but they had altogether disappeared at 50 min. In 2 min., stiff extension of the limbs occurred; in 15 min., well-marked paralysis was present; and in 1 hour, general flaccidity. Frequently, tremors and weak spasms occurred. —Rigor first began to set in at 28 min. after death (temp. of laboratory, 62° F.).
204.	3 lbs. 1 oz.	0·183	3·06	3	Death, in 52 min. after the administration of physostigma.	*With physostigma*, none. The original size was $\frac{13}{50} \times \frac{11}{50}$. *After atropia*, the size was in 3 min., $\frac{17}{50} \times \frac{17}{50}$; in 30 min., $\frac{18}{50} \times \frac{18}{50}$; and in 45 min., $\frac{18}{50} \times \frac{18}{50}$. — After death, it was in 1 min., $\frac{14}{50} \times \frac{14}{50}$; in 15 min., $\frac{10}{50} \times \frac{9}{50}$; and in 1 hour 14 min., $\frac{13}{50} \times \frac{11}{50}$.	*With physostigma*, in 4 min., slowing from 43 to 36 per 10 sec. *After atropia*, the rate per 10 sec. was in 4 min., 56; in 38 min., 52; in 43 min., 50; and in 45 min., 42.	*With physostigma*, in 3 min., slowing from 38 to 35 per 10 sec. *After atropia*, the rate per 10 sec. was in 3 min., 34; in 16 min., 32; in 21 min., 16; in 27 min., 11; and in 39 min., 8. Soon afterwards, only gasps occurred until death.	*With physostigma*, none. *After atropia*, none. There was no defæcation, urination, nor salivation.	*With physostigma*, in 2 min., infrequent and slight fibrillary twitches. *After atropia*, the fibrillary twitches became pretty well marked, but soon they altogether ceased. In 13 min., slight paralysis; and in 38 min., general flaccidity. Frequently, tremors and weak spasms occurred.—Rigor first began to set in at about 30 min. after death (temp. of laboratory, 54° F.).

TABLE 4.—EXPERIMENTS WITH TWICE THE MINIMUM-LETHAL DOSE OF PHYSOSTIGMA (0·24 *gr. of Sulphate of Physostigmia per Three Pounds Weight of Rabbit*).

Number of Experiment.	Weight of Rabbit.	Dose of Physostigma (in Grains). Actual Dose of Sul. of Physostigmia.	Doses of Sulphate of Atropia (in Grains). Actual Dose.	Doses of Sulphate of Atropia (in Grains). Dose p. 3 lbs. of Animal.	Result.	Effect on the Pupils. (The Measurements are in fiftieths of an inch.)	Effect on the Heart.	Effect on the Respirations.	Effect on Secretion and Excretion.	Effects on Motility, &c.
205.	3 lbs. 4 oz.	0·26	0·05	0·05	Death, in 46 min. after the administration of physostigma.	*With physostigma*, none. The original size was $\frac{13}{50} \times \frac{13}{50}$. *After atropia*, the size was in 14 min., $\frac{15}{50} \times \frac{15}{50}$; and in 40 min., $\frac{19}{50} \times \frac{19}{50}$. —After death, the size was in 1 min., $\frac{16}{50} \times \frac{16}{50}$; in 1 min. 30 sec., $\frac{12}{50} \times \frac{12}{50}$; in 4 min., $\frac{6}{50} \times \frac{6}{50}$; and in 55 min., $\frac{10}{50} \times \frac{10}{50}$.	*With physostigma*, in 4 min., slowing from 40 to 35 per 10 sec. *After atropia*, the rate per 10 sec. was in 30 min., 41; and in 34 min., 30.	*With physostigma*, none. The original rate was 30 per 10 sec. *After atropia*, the rate per 10 sec. was in 17 min., 36; in 31 min., 8; in 35 min., 6; and in 37 min., 12. Afterwards, only gasps occurred. The respirations were accompanied with moist sounds until about 12 min. before death.	*With physostigma*, none. *After atropia*, in 6 min., the secretion of certain buccal glands was increased, and soon afterwards salivation occurred; and this increase continued until 15 min. before death. There was neither defæcation nor urination.	*With physostigma*, in 3 min., infrequent and slight fibrillary twitches. *After atropia*, the fibrillary twitches soon became very well marked, but they lessened considerably shortly before death. In 6 min., slight paralysis; and in 27 min., general flaccidity. Frequently, tremors occurred. —Rigor first began to set in at about 50 min. after death (temp. of laboratory, 58° F.).
206.	3 lbs.	0·24	0·08	0·08	Death, in about 50 min. after the administration of physostigma.	*With physostigma*, in 4 min., dilatation from $\frac{8}{50} \times \frac{8}{50}$ to $\frac{10}{50} \times \frac{9}{50}$. *After atropia*, the size was in 3 min., $\frac{15}{50} \times \frac{15}{50}$; in 5 min., $\frac{17}{50} \times \frac{18}{50}$; and in 15 min., $\frac{16}{50} \times \frac{15}{50}$.	*With physostigma*, in 4 min. 30 sec., slowing from 40 to 30 per 10 sec. *After atropia*, the rate per 10 sec. was in 4 min., 48; and in 17 min., 56.	*With physostigma*, in 3 min., slowing from 16 to 14 per 10 sec. *After atropia*, the rate per 10 sec. was in 6 min., 20; in 15 min., 16; and in 42 min., 5.	*With physostigma*, none. *After atropia*, in 1 min., slight increase in the secretion of certain buccal glands, which ceased in about 4 min. There was no defæcation, urination, nor salivation.	*With physostigma*, in 2 min., infrequent and slight fibrillary twitches. *After atropia*, the fibrillary twitches soon became well marked. In 5 min., some extension of the limbs took place; in 8 min., there was slight paralysis; and in 29 min., general flaccidity. Tremors frequently occurred.
207.	3 lbs. 8 oz.	0·28	0·093	0·08	Death, in 51 min. after the administration of physostigma.	*With physostigma*, in 2 min. 30 sec., dilatation from $\frac{13}{50} \times \frac{13}{50}$ to $\frac{14}{50} \times \frac{13}{50}$. *After atropia*, the size was in 6 min., $\frac{16}{50} \times \frac{16}{50}$; in 12 min., $\frac{17}{50} \times \frac{16}{50}$; in 37 min., $\frac{11}{50} \times \frac{12}{50}$; and in 45 min., $\frac{14}{50} \times \frac{13}{50}$. —After death, it was in 1 min., $\frac{12}{50} \times \frac{11}{50}$; and in 3 min., $\frac{10}{50} \times \frac{12}{50}$.	*With physostigma*, in 4 min. 30 sec., slowing from 42 to 37 per 10 sec. *After atropia*, the rate per 10 sec. was in 3 min., 26; in 6 min., 43; in 11 min., 56; and in 41 min., 21.	*With physostigma*, none. The original rate was 21 per 10 sec. *After atropia*, the rate per 10 sec. was in 11 min., 24; and in 37 min., 5. Afterwards, gasps only occurred. In 20 min., respiration was impeded by mucus in the fauces, and continued to be so impeded until death.	*With physostigma*, none. *After atropia*, in 4 min., slight increase occurred in the secretion of certain buccal glands, which soon became greater, and continued until death. There was salivation and defæcation, but no urination.	*With physostigma*, in 1 min., infrequent and slight fibrillary twitches. *After atropia*, the fibrillary twitches soon became well marked, and continued so until death. In 6 min., the limbs were extended; in 11 min., there was slight paralysis; and in 27 min., general flaccidity. Frequently, tremors and weak general spasms took place.—There was no rigor at 36 min. after death (temp. of laboratory, 62° F.).
208.	3 lbs. 4½ oz.	0·26	0·1	0·09	Death, in 30 min. after the administration of physostigma.	*With physostigma*, none. The original size was $\frac{10}{50} \times \frac{11}{50}$. *After atropia*, the size was in 8 min., $\frac{13}{50} \times \frac{13}{50}$; in 15 min., $\frac{8}{50} \times \frac{7}{50}$; and in 22 min., $\frac{4}{50} \times \frac{3}{50}$.—After death, the size was in 3 min., $\frac{5}{50} \times \frac{4}{50}$; and in 50 min., $\frac{6}{50} \times \frac{6}{50}$.	*With physostigma*, in 4 min., slowing from 38 to 35 per 10 sec. *After atropia*, the rate could not be accurately determined on account of fibrillary twitches and restlessness, but the impulse was weak, and occurred infrequently, so often as it was examined.	*With physostigma*, none. The original rate was 10 per 10 sec. *After atropia*, the rate per 10 sec. was in 22 min., 4; and afterwards only weak gasps occurred. In 12 min., the respirations were noisy; they soon became much impeded by mucus, and continued to be so until death.	*With physostigma*, none. *After atropia*, in 3 min., slight increase in the secretion of certain buccal glands, which soon became greater, and continued until death. In 22 min., several normal fæcal pellets were passed; but there was no urination.	*With physostigma*, in 1 min., infrequent and slight fibrillary twitches. *After atropia*, the fibrillary twitches soon became well marked, and continued so until death. In 5 min., there was some extension of the limbs; in 8 min., slight paralysis; and in 20 min., general flaccidity. Tremors frequently occurred.—Rigor first began to set in at about 50 min. after death (temp. of laboratory, 61° F.).

Number of Experiment.	Weight of Rabbit.	Dose of Physostigma (in Grains). Actual Dose of Sul. of Physostigmia.	Doses of Sulphate of Atropia (in Grains). Actual Dose.	Doses of Sulphate of Atropia (in Grains). Dose p. 3 lbs. of Animal.	Result.	Effect on the Pupils. (The Measurements are in fiftieths of an inch.)	Effect on the Heart.	Effect on the Respirations.	Effect on Secretion and Excretion.	Effects on Motility, &c.
209. *a*	3 lbs. 12 oz. [Experiment *b* was performed fourteen days after experiment *a*.]	0·3	0·12	0·1	Recovery.	*With physostigma*, none. The original size was $\frac{10}{50} \times \frac{9}{50}$. *After atropia*, the size was in 9 min., $\frac{15}{50} \times \frac{15}{50}$; in 1 hour 20 min., $\frac{16}{50} \times \frac{16}{50}$; and in 2 hours 5 min., $\frac{14}{50} \times \frac{14}{50}$.—On the following day, it was $\frac{14}{50} \times \frac{14}{50}$; and on the 4th day, $\frac{11}{50} \times \frac{13}{50}$.	*With physostigma*, in 4 min., slowing from 40 to 33 per 10 sec. *After atropia*, the rate per 10 sec. was in 1 hour 22 min., 46; and in 2 hours, also 46.—On the following day, it was 31; and on the 4th day, 35.	*With physostigma*, in 4 min. 10 sec., acceleration from 29 to 33 per 10 sec. *After atropia*, the rate per 10 sec. was in 45 min., 22; and in 2 hours 10 min., 15.	*With physostigma*, none. *After atropia*, in 2 hours, a few normal fæcal pellets were passed. There was no defæcation, salivation, nor evidence of increase in the secretion of any buccal gland.	*With physostigma*, in 2 min., infrequent and slight fibrillary twitches. *After atropia*, the fibrillary twitches soon became very well marked, and continued so for at least 2 hours. In 9 min., slight paralysis; in 44 min., well-marked paralysis; and in 2 hours 10 min, almost no paralysis. Tremors and starts frequently occurred.
b	3 lbs. 11 oz.	0·22 (= about 0·18 gr. p. 3 lbs.)	0	0	Death, in 12 min.	—	—	—	—	—
210. *a*	3 lbs. 1 oz. [Experiment *b* was performed nine days after experiment *a*.]	0·245	0·2	0·2	Recovery.	*With physostigma*, none. The original size was $\frac{11}{50} \times \frac{10}{50}$. *After atropia*, the size was in 2 min., $\frac{8}{50} \times \frac{7}{50}$; in 5 min., $\frac{14}{50} \times \frac{14}{50}$; in 7 min., $\frac{16}{50} \times \frac{16}{50}$; and in 1 hour, $\frac{16}{50} \times \frac{15}{50}$.—On the following day, it was $\frac{13}{50} \times \frac{12}{50}$; and on the 6th day, $\frac{11}{50} \times \frac{10}{50}$.	*With physostigma*, none noted. The original rate was 40 per 10 sec. *After atropia*, the rate per 10 sec. was not noted until the following day, when it was 30.	*With physostigma*, none. The original rate was 21 per 10 sec. *After atropia*, the rate was not noted.	*With physostigma*, none. *After atropia*, in 2 min., increase in the secretion of certain buccal glands, sufficient to cause moist sounds with respiration; but this ceased in 3 min. There was no salivation, defæcation, nor urination.	*With physostigma*, in 1 min. 30 sec., infrequent and slight fibrillary twitches; and in 4 min. 30 sec., confused stumbling movements. *After atropia*, the fibrillary twitches soon became well marked, and continued so for at least 1 hour. In 7 min., slight paralysis; in 16 min., well-marked paralysis; and in 1 hour 15 min., also well-marked paralysis. Frequently tremors and starts occurred.
b	3 lbs. 2 oz.	0·127 (= 0·12 gr. p. 3 lbs.)	0	0	Death, in 15 min.	—	—	—	—	—
211. *a*	3 lbs. 2½ oz. [Experiment *b* was performed ten days after experiment *a*.]	0·25	0·31	0·3	Recovery.	*With physostigma*, none. The original size was $\frac{13}{50} \times \frac{13}{50}$. *After atropia*, the size was in 4 min., $\frac{18}{50} \times \frac{18}{50}$; in 50 min., $\frac{19}{50} \times \frac{19}{50}$; and in 1 hour, $\frac{19}{50} \times \frac{19}{50}$.—On the following day, it was $\frac{16}{50} \times \frac{16}{50}$; and on the 4th day, $\frac{14}{50} \times \frac{13}{50}$.	*With physostigma*, none noted. The original rate was 36 per 10 sec. *After atropia*, the rate per 10 sec. could not be accurately determined because of the fibrillary twitches, until 1 hour 20 min., when it was 40. —On the following day, it was 47; and on the 4th day, 43.	*With physostigma*, in 3 min., acceleration from 24 to 26 per 10 sec. *After atropia*, the rate per 10 was in 1 hour 20 min., 25.	*With physostigma*, in 4 min., slight increase in the secretion of certain buccal glands. *After atropia*, none. There was no defæcation, urination, nor salivation during the 1 hour and 20 min. of continuous observation.	*With physostigma*, in 2 min., slight fibrillary twitches; and in 4 min. 30 sec., unsteadiness. *After atropia*, the fibrillary twitches soon became very well marked, and continued so for at least 1 hour. In 18 min., slight paralysis; in 26 min., well-marked paralysis; and in 1 hour 20 min., marked, though lessened, paralysis. Tremors and feeble general spasms frequently occurred.
b	3 lbs. 3¼ oz.	0.128 (= 0·12 gr. p. 3 lbs.)	0	0	Death, in 27 min.	—	—	—	—	—

Number of Experiment.	Weight of Rabbit.	Dose of Physostigma (in Grains). Actual Dose of Sul. of Physostigmia.	Doses of Sulphate of Atropia (in Grains). Actual Dose.	Doses of Sulphate of Atropia (in Grains). Dose p. 3 lbs. of Animal.	Result.	Effect on the Pupils. (The Measurements are in fiftieths of an inch.)	Effect on the Heart.	Effect on the Respirations.	Effect on Secretion and Excretion.	Effects on Motility, &c.
212. *a*	3 lbs. 5 oz. [Experiment *b* was performed twelve days after experiment *a*.]	0·26	0·43	0·4	Recovery.	*With physostigma*, in 4 min., dilatation from $\frac{14}{50} \times \frac{13}{50}$ to $\frac{15}{50} \times \frac{14}{50}$. *After atropia*, the size was in 3 min., $\frac{17}{50} \times \frac{17}{50}$; and in 1 hour, about $\frac{20}{50} \times \frac{20}{50}$.—On the following day, it was $\frac{20}{50} \times \frac{20}{50}$; on the 7th day, $\frac{15}{50} \times \frac{12}{50}$; and on the 10th day, $\frac{14}{50} \times \frac{15}{50}$.	*With physostigma*, in 4 min. 30 sec., slowing from 39 to 37 per 10 sec. *After atropia*, the rate per 10 sec. was in 4 min., 56; in 15 min., 58; and in 50 min., 50.—On the following day, it was 34; on the 3d day, 33; on the 4th day, 48; and on the 7th day, 41.	*With physostigma*, in 3 min. 30 sec., acceleration from 20 to 31 per 10 sec. *After atropia*, the rate per 10 sec. was in 15 min., 31; and in 48 min., 21.	*With physostigma*, none noted. *After atropia*, in 2 min., slight increase in the secretion of certain buccal glands, which ceased in a few min. There was no defæcation, urination, nor salivation during the 1 hour of continuous observation.	*With physostigma*, in 2 min. 30 sec., slight fibrillary twitches. *After atropia*, the fibrillary twitches became well marked, and continued so for at least 1 hour. In 8 min., slight paralysis; and in 15 min., well-marked paralysis, which had not appreciably lessened in 1 hour. Occasionally weak tremors and starts took place.
b	3 lbs. 6 oz.	0·13 (= 0·12 gr. p. 3 lbs.)	0	0	Death, in 16 min.	—	—	—	—	—
213. *a*	3 lbs. [Experiment *b* was performed eighteen days after experiment *a*.]	0·24	0·5	0·5	Recovery.	*With physostigma*, in 4 min., dilatation from $\frac{9}{50} \times \frac{8}{50}$ to $\frac{10}{50} \times \frac{9}{50}$. *After atropia*, the size was in 6 min., $\frac{16}{50} \times \frac{16}{50}$; in 35 min., $\frac{15}{50} \times \frac{15}{50}$; in 58 min., $\frac{13}{50} \times \frac{11}{50}$; and in 1 hour 40 min., $\frac{10}{50} \times \frac{9}{50}$.—On the following day, it was $\frac{10}{50} \times \frac{9}{50}$; and on the 3d day, $\frac{8}{50} \times \frac{7}{50}$.	*With physostigma*, in 4 min. 30 sec., slowing from 40 to 34 per 10 sec. *After atropia*, the rate per 10 sec. was in 5 min., 50. Further observations were not possible on account of the well-marked fibrillary twitches.—On the following day, the rate per 10 sec. was 36; and on the 3d day, 41.	*With physostigma*, in 3 min., slowing from 24 to 20 per 10 sec. *After atropia*, the rate per 10 sec. was in 43 min., 19; and in 1 hour 20 min., 18.	*With physostigma*, none. *After atropia*, in 25 min. and in 55 min., urine was voided. In 1 hour 30 min. and in 1 hour 50 min., a number of wet fæcal pellets were passed. There was not any obvious increase in the secretion of the buccal glands.	*With physostigma*, in 1 min. 30 sec., infrequent and slight fibrillary twitches. *After atropia*, the fibrillary twitches soon became very well marked, and continued so for at least 1 hour 50 min. In 9 min., slight paralysis; in 25 min., well-marked paralysis; and in 1 hour 55 min., only slight paralysis. Frequently tremors and starts occurred.
b	3 lbs. 3½ oz.	0·125 (= 0·12 gr. p. 3 lbs.)	0	0	Death, in 23 min.	—	—	—	—	—
214. *a*	3 lbs. [Experiment *b* was performed ten days after experiment *a*.]	0·24	0·5	0·5	Recovery.	*With physostigma*, none noted. The original size was $\frac{13}{50} \times \frac{11}{50}$. *After atropia*, the size was in 5 min., $\frac{16}{50} \times \frac{16}{50}$; in 11 min., $\frac{17}{50} \times \frac{17}{50}$; and in 2 hours, $\frac{17}{50} \times \frac{17}{50}$.—On the following day, it was $\frac{17}{50} \times \frac{17}{50}$; on the 3d day, $\frac{16}{50} \times \frac{16}{50}$; and on the 10th day, $\frac{13}{50} \times \frac{13}{50}$.	*With physostigma*, none noted. The original rate was 42 per 10 sec. *After atropia*, none noted until 1 hour 40 min., when the rate per sec. was 41.—On the following day also, it was 41.	*With physostigma*, in 4 min., slowing from 22 to 19 per 10 sec. *After atropia*, the rate per 10 sec. was in 8 min., 23; in 15 min., 20; in 55 min., 19; and in 1 hour 21 min., 16.—On the following day, it was 30, and irregular.	*With physostigma*, none. *After atropia*, in 1 min., there was slight increase in the secretion of certain buccal glands, which ceased in a few min. In 1 hour 3 min., a few normal fæcal pellets were passed. There was no urination nor salivation during the 2 hours 5 min. of continuous observation.	*With physostigma*, in 2 min. 30 sec., infrequent and slight fibrillary twitches. *After atropia*, the fibrillary twitches soon became well marked, but they had altogether ceased at 55 min. In 5 min., slight paralysis; in 7 min., well-marked paralysis, which continued for about 1 hour 30 min.; and in 2 hours 5 min., decided, though lessened, paralysis. Occasionally slight tremors occurred.
b	2 lbs. 15 oz.	0·117 (= 0·12 gr. p. 3 lbs.)	0	0	Death, in 29 min.	—	—	—	—	—

Number of Experiment.	Weight of Rabbit.	Dose of Physostigma (in Grains). Actual Dose of Sul. of Physostigmia.	Doses of Sulphate of Atropia (in Grains). Actual Dose.	Doses of Sulphate of Atropia (in Grains). Dose p. 3 lbs. of Animal.	Result.	Effect on the Pupils. (The Measurements are in fiftieths of an inch.)	Effect on the Heart.	Effect on the Respirations.	Effect on Secretion and Excretion.	Effects on Motility, &c.
215. *a* [Experiment *b* was performed six days after experiment *a*.]	3 lbs. 3 oz.	0·25	0·83	0·8	Recovery.	*With physostigma*, none. The original size was $\frac{12}{50} \times \frac{11}{50}$. *After atropia*, the size was in 3 min., $\frac{15}{50} \times \frac{15}{50}$; in 8 min., $\frac{17}{50} \times \frac{17}{50}$; and in 45 min., $\frac{18}{50} \times \frac{18}{50}$.—On the following day, it was $\frac{16}{50} \times \frac{16}{50}$.	*With physostigma*, in 4 min. 30 sec., slowing from 41 to 31 per 10 sec. *After atropia*, the rate per 10 sec. was in 5 min., 58; in 11 min., 52; and in 34 min., 40.—On the following day, it was 40.	*With physostigma*, none. The original rate was 14 per 10 sec. *After atropia*, in 46 min., the rate was 14 per 10 sec.	*With physostigma*, none. *After atropia*, in 2 min., slight increase in the secretion of certain buccal glands. No salivation, defæcation, nor urination occurred during the 50 min. of continuous observation.	*With physostigma*, in 2 min., infrequent and slight fibrillary twitches. *After atropia*, the fibrillary twitches became pretty well marked. In 5 min., slight paralysis; and in 5 min., decided though not great paralysis.
b	3 lbs. 2 oz.	0·125 (= 0·12 gr. p. 3 lbs.)	0	0	Death, in 19 min.	—	—	—	—	—
216. *a* [Experiment *b* was performed eleven days after experiment *a*.]	2 lbs. 12 oz.	0·22	0·8	0·9	Recovery.	*With physostigma*, none. The original size was $\frac{11}{50} \times \frac{10}{50}$. *After atropia*, the size was in 5 min., $\frac{15}{50} \times \frac{15}{50}$; in 24 min., $\frac{10}{50} \times \frac{10}{50}$; in 2 hours, $\frac{14}{50} \times \frac{14}{50}$; and in 3 hours 30 min., $\frac{13}{50} \times \frac{11}{50}$.—On the following day, it was $\frac{15}{50} \times \frac{15}{50}$.	*With physostigma*, in 4 min. 30 sec., slowing from 37 to 31 per 10 sec. *After atropia*, the rate per 10 sec. was in 7 min., about 52; in 2 hours, 48; and in 3 hours 31 min., 34.—On the following day, it was 23.	*With physostigma*, in 3 min. 30 sec., slowing from 26 to 23 per 10 sec. *After atropia*, the rate per 10 sec. was in 2 min., 28; in 20 min., 16; in 2 hours, 14; and in 3 hours 29 min., 12.	*With physostigma*, none. *After atropia*, in 3 min, slight increase in the secretion of certain buccal glands, which ceased in a few minutes. In 2 hours, urine was voided; and in 2 hours 30 min., several soft fæcal pellets were passed.	*With physostigma*, in 1 min. 30 sec., infrequent and slight fibrillary twitches. *After atropia*, the fibrillary twitches soon became very well marked, but they had lessened considerably in 2 hours. In 6 min., stiff extension of the fore limbs; in 12 min., slight paralysis; in 20 min., well-marked paralysis; and in 3 hours only slight paralysis. Tremors frequently occurred.
b	2 lbs. 14 oz.	0·115 (= 0·12 gr. p. 3 lbs.)	0	0	Death, in 24 min.	—	—	—	—	—
217. *a* [Experiment *b* was performed twelve days after experiment *a*.]	3 lbs. 10 oz.	0·29	1·2	1·	Recovery.	*With physostigma*, none. The original size was $\frac{15}{50} \times \frac{15}{50}$. *After atropia*, the size was in 13 min., $\frac{13}{50} \times \frac{12}{50}$; and this remained for at least 1 hour 45 min.—On the following day, the size was $\frac{13}{50} \times \frac{13}{50}$; and on the 5th day, $\frac{15}{50} \times \frac{13}{50}$.	*With physostigma*, in 4 min., slowing from 41 to 35 per 10 sec. *After atropia*, the rate per 10 sec. was in 7 min., 50; and in 36 min., 52.—On the following day, it was 46; on the 4th day, 43; on the 5th day, 39; and on the 6th day, 41.	*With physostigma*, in 3 min., acceleration from 21 to 31 per 10 sec. *After atropia*, the rate per 10 sec. was in 18 min., 29; in 33 min., 14; in 43 min., 12; and in 1 hour 20 min., 12.—On the following day it was 19.	*With physostigma*, none. *After atropia*, none. There was no salivation, defæcation, nor urination during the 1 hour 50 min. of continuous observation.	*With physostigma*, slight fibrillary twitches and unsteadiness. *After atropia*, the fibrillary twitches soon became well marked, but in 30 min. they were only slight, while in 1 hour 43 min. they had altogether ceased. In 5 min., slight paralysis; and in 30 min., well marked paralysis, which had not perceptibly lessened in 1 hour 50 min. Frequently tremors occurred, and on several occasions there were feeble general spasms.
b	3 lbs. 10 oz.	0·145 (= 0·12 gr. p. 3 lbs.)	0	0	Death, in 44 min.	—	—	—	—	—

Number of Experiment.	Weight of Rabbit.	Dose of Physostigma (in Grains). Actual Dose of Sul. of Physostigmia.	Doses of Sulphate of Atropia (in Grains). Actual Dose.	Doses of Sulphate of Atropia (in Grains). Dose p. 3 lbs. of Animal.	Result.	Effect on the Pupils. (The Measurements are in fiftieths of an inch.)	Effect on the Heart.	Effect on the Respirations.	Effect on Secretion and Excretion.	Effects on Motility, &c.
218. *a* [Experiment *b* was performed twelve days after experiment *a*.]	3 lbs. 4 oz.	0·26	1·3	1·2	Recovery.	*With physostigma*, none. The original size was $\frac{13}{50} \times \frac{13}{50}$. *After atropia*, the size was in 1 min., $\frac{19}{50} \times \frac{19}{50}$; and in 2 hours, $\frac{13}{50} \times \frac{13}{50}$. —On the following day, it was $\frac{16}{50} \times \frac{16}{50}$; and on the 4th day, $\frac{15}{50} \times \frac{15}{50}$.	*With physostigma*, in 4 min., slowing from 39 to 35 per 10 sec. *After atropia*, the rate per 10 sec. was in 1 min. 20 sec., 56; in 15 min., about 62; and in 2 hours, 50.—On the following day, it was 19; and on the 4th day, 36.	*With physostigma*, none noted. The original rate was 27 per 10 sec. *After atropia*, the rate per 10 sec. was in 40 sec., 32; in 11 min., 41; in 35 min., 12; in 1 hour 30 min., 12; and in 2 hours, 17.	*With physostigma*, none. *After atropia*, none. There was no salivation, defæcation, nor urination during the 2 hours of continuous observation.	*With physostigma*, in 1 min. 10 sec., slight fibrillary twitches. *After atropia*, the fibrillary twitches soon became very well marked, but in 2 hours they were only pretty well marked. In 6 min., slight paralysis; in 50 min., very well marked paralysis; and in 2 hours, well marked, though lessened, paralysis. Frequently, weak tremors occurred, and on several occasions there were feeble confused movements.
	b 3 lbs. 11 oz.	0·147 (= 0·12 gr. p. 3 lbs.)	0	0	Death, in 27 min.	—	—	—	—	—
219.	4 lbs. 2 oz.	0·33	1·73	1·3	Death, in 50 min. after the administration of physostigma.	*With physostigma*, in 3 min., dilatation from $\frac{13}{50} \times \frac{11}{50}$ to $\frac{13}{50} \times \frac{13}{50}$. *After atropia*, the size was in 6 min., $\frac{17}{50} \times \frac{17}{50}$; and in 42 min., $\frac{17}{50} \times \frac{17}{50}$. —After death, it was in 1 min., $\frac{15}{50} \times \frac{15}{50}$; in 5 min., $\frac{13}{50} \times \frac{13}{50}$; and in 1 hour 38 min., $\frac{13}{50} \times \frac{13}{50}$.	*With physostigma*, in 4 min. 30 sec., slowing from 43 to 34 per 10 sec. *After atropia*, the rate per 10 sec. was in 28 min., 60; in 33 min., 50; in 38 min., 32; and in 44 min., 27.	*With physostigma*, in 3 min. 30 sec., acceleration from 23 to 33 per 10 sec. *After atropia*, the rate per 10 sec. was in 3 min., 25; in 15 min., 18; in 28 min., 13; and in 31 min., 8. Afterwards, only infrequent and gasping respiratory movements took place.	*With physostigma*, none. *After atropia*, none. There was no defæcation, urination, nor salivation.	*With physostigma*, in 1 min. 30 sec., infrequent and slight fibrillary twitches. *After atropia*, the fibrillary twitches soon became well marked, but in 28 min. they had altogether ceased. In 11 min., decided paralysis; and in 15 min., general flaccidity. Tremors and weak general spasms frequently occurred.—Rigor began to set in at about 1 hour 30 min. after death (temp. of laboratory, 63° F.).
220.	3 lbs. 6 oz.	0·27	1·46	1·3	Death, in 1 hour 3 min. after the administration of physostigma.	*With physostigma*, in 3 min., dilatation from $\frac{13}{50} \times \frac{13}{50}$ to $\frac{14}{50} \times \frac{13}{50}$. *After atropia*, the size was in 5 min., $\frac{12}{50} \times \frac{12}{50}$; and in 57 min., $\frac{13}{50} \times \frac{13}{50}$. —After death, it was in 1 min., $\frac{14}{50} \times \frac{13}{50}$; in 3 min., $\frac{10}{50} \times \frac{9}{50}$; and in 30 min., $\frac{11}{50} \times \frac{11}{50}$.	*With physostigma*, in 4 min., slowing from 40 to 30 per 10 sec. *After atropia*, the rate per 10 sec. was in 8 min., 54; in 48 min., 48; and in 53 min., 22.	*With physostigma*, in 2 min., acceleration from 26 to 32 per 10 sec. *After atropia*, the rate per 10 sec. was in 4 min., 31; in 13 min., 41; in 20 min., 17; in 35 min., 14; and in 41 min., 11. Soon afterwards, infrequent gasps only took place.	*With physostigma*, in 2 min., slight increase in the secretion of certain buccal glands. *After atropia*, the above increase continued for only a few min. There was no defæcation, urination, nor salivation.	*With physostigma*, in 3 min., pretty well-marked fibrillary twitches. *After atropia*, the fibrillary twitches became well marked, but they had greatly lessened before death. In 11 min., slight paralysis; and in 36 min., general flaccidity. Frequently tremors occurred, and on several occasions feeble general spasms.—There was no rigor 28 min. after death.

Number of Experiment.	Weight of Rabbit.	Dose of Physostigma (in Grains). Actual Dose of Sul. of Physostigmia.	Doses of Sulphate of Atropia (in Grains). Actual Dose.	Doses of Sulphate of Atropia (in Grains). Dose p. 3 lbs. of Animal.	Result.	Effect on the Pupils. (The Measurements are in fiftieths of an inch.)	Effect on the Heart.	Effect on the Respirations.	Effect on Secretion and Excretion.	Effects on Motility, &c.
221.	3 lbs.	0·24	1·5	1·5	Death, in 1 hour 4 min. after the administration of physostigma.	*With physostigma*, none. The original size was $\frac{13}{50} \times \frac{11}{50}$. *After atropia*, the size was in 3 min., $\frac{18}{50} \times \frac{16}{50}$; and in 20 min., $\frac{17}{50} \times \frac{17}{50}$, which size remained until death.	*With physostigma*, in 4 min. 30 sec., slowing from 44 to 37 per 10 sec. *After atropia*, none noted.	*With physostigma*, in 3 min., acceleration from 32 to 35 per 10 sec. *After atropia*, the rate per 10 sec. was in 12 min., 34; and in 26 min., 16.	*With physostigma*, none. *After atropia*, in 1 min., slight increase in the secretion of certain buccal glands, which ceased in a few min. There was no defæcation, urination, nor salivation.	*With physostigma*, in 3 min. 30 sec., pretty well marked fibrillary twitches. *After atropia*, the fibrillary twitches soon became very well marked, and they continued so until a few minutes before death. In 8 min., slight paralysis; in 24 min., well-marked paralysis; and in 44 min., flaccidity. Occasionally tremors occurred.
222.	3 lbs. 10 oz.	0·29	2·4	2	Death, in 1 hour 11 min. after the administration of physostigma.	*With physostigma*, none. The original size was $\frac{13}{50} \times \frac{13}{50}$. *After atropia*, the size was in 2 min., $\frac{17}{50} \times \frac{17}{50}$; and in 1 hour 5 min., $\frac{15}{50} \times \frac{15}{50}$.—After death, it was in 2 min., $\frac{16}{50} \times \frac{16}{50}$; and in 9 min., $\frac{10}{50} \times \frac{9}{50}$.	*With physostigma*, in 4 min. 30 sec., slowing from 47 to 38 per 10 sec. *After atropia*, the rate per 10 sec. was in 3 min., 51; and in 30 min., 60.	*With physostigma*, none. The original rate was 34 per 10 sec. *After atropia*, the rate per 10 sec. was in 20 min., 45; in 30 min., 22; in 57 min., 9; and in 1 hour, 7. Afterwards, only gasping or feeble non-rhythmical respiratory movements took place.	*With physostigma*, none. *After atropia*, none. There was no defæcation, urination, nor salivation.	*With physostigma*, in 3 min., pretty well-marked fibrillary twitches. *After atropia*, in 40 min., the twitches had become very slight, and they soon disappeared. In 17 min., distinct paralysis; in 45 min., well-marked paralysis; and in 1 hour, general flaccidity. Tremors frequently occurred.
223.	3 lbs.	0·24	2·5	2·5	Death, in 54 min. after the administration of physostigma.	*With physostigma*, none noted. The original size was $\frac{15}{50} \times \frac{14}{50}$. *After atropia*, the size was in 35 min., $\frac{18}{50} \times \frac{18}{50}$, and this size remained until death.—After death, it was in 2 min., $\frac{15}{50} \times \frac{14}{50}$; and in 10 min., $\frac{7}{50} \times \frac{6}{50}$.	*With physostigma*, in 4 min., slowing from 34 to 28 per 10 sec. *After atropia*, the rate per 10 sec. was in 4 min., 53; in 35 min., 55; and in 42 min., 43.	*With physostigma*, none. The original rate was 18 per 10 sec. *After atropia*, the rate per 10 sec. was in 35 min., 22; in 40 min., 7; and in 43 min., 4. Afterwards, gasps and imperfect respiratory movements only occurred.	*With physostigma*, none. *After atropia*, none. There was no defæcation, urination, nor salivation.	*With physostigma*, in 2 min., slight fibrillary twitches. *After atropia*, the twitches became pretty well marked, but they soon altogether disappeared. In 5 min., slight paralysis; in 30 min., well-marked paralysis; and in 45 min., general flaccidity. Tremors frequently occurred. — Rigor began to set in at about 40 min. after death.

TABLE 5.—EXPERIMENTS WITH TWO AND A HALF TIMES THE MINIMUM-LETHAL DOSE OF PHYSOSTIGMA (0·3 *gr. of Sulphate of Physostigmia per Three Pounds Weight of Rabbit*).

Number of Experiment.	Weight of Rabbit.	Dose of Physostigma (in Grains). Actual Dose of Sul. of Physostigmia.	Doses of Sulphate of Atropia (in Grains). Actual Dose.	Doses of Sulphate of Atropia (in Grains). Dose p. 3 lbs. of Animal.	Result.	Effect on the Pupils. (The Measurements are in fiftieths of an inch.)	Effect on the Heart.	Effect on the Respirations.	Effect on Secretion and Excretion.	Effects on Motility, &c.
224.	3 lbs.	0·3	0·05	0·05	Death, in 30 min. after the administration of physostigma.	*With physostigma*, none. The original size was $\frac{13}{50} \times \frac{13}{50}$. *After atropia*, the size was in 4 min., $\frac{18}{50} \times \frac{18}{50}$; in 8 min., $\frac{10}{50} \times \frac{9}{50}$; in 9 min., $\frac{8}{50} \times \frac{7}{50}$; in 13 min., $\frac{7}{50} \times \frac{6}{50}$; and in 24 min., $\frac{10}{50} \times \frac{10}{50}$.—After death, it was in 1 min., $\frac{9}{50} \times \frac{8}{50}$; and in 20 min., $\frac{10}{50} \times \frac{9}{50}$.	*With physostigma*, in 4 min., 30 sec., slowing from 40 to 32 per 10 sec. *After atropia*, the rate per 10 sec. was in 4 min., 57; in 11 min., 32; and in 21 min., 19.	*With physostigma*, in 2 min., slowing from 20 to 18 per 10 sec. *After atropia*, the rate per 10 sec. was in 13 min., 10; and in 20 min., 6. Afterwards only infrequent gasps occurred.	*With physostigma*, none. *After atropia*, in 4 min., several fæcal pellets were passed; in 13 min., urine was voided; and in 23 min., salivation began.	*With physostigma*, in 1 min. 30 sec., slight fibrillary twitches. *After atropia*, the fibrillary twitches soon became well marked, and continued so until death. In 3 min., slight paralysis; and in 10 min., general flaccidity. Frequently tremors took place.—Rigor began to set in at 58 min. after death (temp. of laboratory, 62° F.)
225.	3 lbs.	0·3	0·08	0·08	Death, in 1 hour after the administration of physostigma.	*With physostigma*, none. The original size was $\frac{14}{50} \times \frac{13}{50}$. *After atropia*, the size was in 4 min., $\frac{17}{50} \times \frac{17}{50}$; in 9 min., $\frac{13}{50} \times \frac{12}{50}$; and in 55 min., $\frac{12}{50} \times \frac{12}{50}$. —After death, it was in 4 min., $\frac{17}{50} \times \frac{17}{50}$; and in 10 min., $\frac{14}{50} \times \frac{14}{50}$.	*With physostigma*, in 4 min. 30 sec., slowing from 40 to 31 per 10 sec. *After atropia*, the rate per 10 sec. was in 8 min., 50; in 33 min., 28; and in 43 min., 26.	*With physostigma*, none. The original rate was 18 per 10 sec. *After atropia*, the rate per 10 sec. was in 13 min., 21; in 22 min., 13; and in 31 min., 5. Soon afterwards the respirations became gasping and very irregular in their occurrence.	*With physostigma*, none. *After atropia*, in 30 sec., slight increase in the secretion of certain buccal glands, which caused noisy respiration in 22 min., but had altogether ceased in 26 min. There was no defæcation, urination, nor salivation.	*With physostigma*, in 2 min., slight fibrillary twitches. *After atropia*, the fibrillary twitches soon became well marked, but they were only slight after 24 min. In 8 min., distinct paralysis; and in 28 min., general flaccidity. Tremors and feeble spasmodic movements occurred.
226. *a*	3 lbs. 12 oz. (Experiment *b* was performed nine days after experiment *a*.)	0·37	0·12	0·1	Recovery.	*With physostigma*, in 4 min., dilatation from $\frac{12}{50} \times \frac{11}{50}$ to $\frac{13}{50} \times \frac{13}{50}$. *After atropia*, the size was in 8 min., $\frac{15}{50} \times \frac{13}{50}$; and in 2 hours 28 min., $\frac{13}{50} \times \frac{13}{50}$.—On the following day, it was $\frac{15}{50} \times \frac{14}{50}$; and on the 7th day, $\frac{13}{50} \times \frac{13}{50}$.	*With physostigma*, in 3 min. 30 sec., slowing from 40 to 32 per 10 sec. *After atropia*, the rate per 10 sec. was in 3 min., 60; and in 2 hours 30 min., 47.—On the following day, it was 31; and on the 3d day, 41.	*With physostigma*, none noted. The original rate was 23 per 10 sec. *After atropia*, the rate per 10 sec was in 1 hour 30 min., 13; and in 2 hours 30 min., 15.—On the following day, it was 17.	*With physostigma*, none. *After atropia*, none. There was no defæcation, urination, nor salivation, during the 2 hours 43 min. of continuous observation.	*With physostigma*, in 3 min., slight fibrillary twitches; and in 4 min. 30 sec., slight paralysis. *After atropia*, the fibrillary twitches soon became very well marked; but they had considerably lessened by 2 hours 40 min. In 20 min., well-marked paralysis, which increased somewhat, and then at about 2 hours 30 min., began to lessen. Frequently weak tremors occurred.
b	3 lbs. 12 oz.	0·15 (= 0·12 gr. p. 3 lbs.)	0	0	Death in 38 min.	—	—	—	—	—

Number of Experiment.	Weight of Rabbit.	Dose of Physostigma (in Grains). Actual Dose of Sul. of Physostigmia.	Doses of Sulphate of Atropia (in Grains). Actual Dose.	Doses of Sulphate of Atropia (in Grains). Dose p. 3 lbs. of Animal.	Result.	Effect on the Pupils. (The Measurements are in fiftieths of an inch.)	Effect on the Heart.	Effect on the Respirations.	Effect on Secretion and Excretion.	Effects on Motility, &c.
227. *a*	3 lbs. [Experiment *b* was performed eight days after experiment *a*.]	0·3	0·15	0·15	Recovery.	*With physostigma*, in 3 min. 30 sec., dilatation from $\frac{13}{50} \times \frac{11}{50}$ to $\frac{18}{50} \times \frac{13}{50}$. *After atropia*, the size was in 8 min., $\frac{18}{50} \times \frac{18}{50}$; in 12 min., $\frac{17}{50} \times \frac{17}{50}$; and in 1 hour 5 min., $\frac{16}{50} \times \frac{16}{50}$.—On the following day, it was $\frac{14}{50} \times \frac{14}{50}$.	*With physostigma*, in 4 min. 30 sec., slowing from 41 to 33 per 10 sec. *After atropia*, the rate per 10 sec. was in 8 min., 54; and in 1 hour 21 min., 48.—On the following day, it was 33; and on the 4th day, 34.	*With physostigma*, none noted. The original rate was 21 per 10 sec. *After atropia*, the rate per 10 sec. was in 20 min., 18; and in 1 hour, 19.—On the following day, it was 13; and on the 4th day, 16.	*With physostigma*, none. *After atropia*, in 2 min., slight increase in the secretion of certain buccal glands. There was no defæcation, urination, nor salivation.	*With physostigma*, in 2 min., slight fibrillary twitches. *After atropia*, the fibrillary twitches soon became very well marked, and they continued so for at least 1 hour 21 min. In 1 min., extension of limbs; in 4 min., slight paralysis; and in 18 min., well-marked paralysis, which had not obviously lessened, in 1 hour 21 min. Occasionally feeble tremors occurred.
b	3 lbs.	0·12	0	0	Death, in 26 min.	—	—	—	—	—
228. *a*	3 lbs. 4 oz. [Experiment *b* was performed ten days after experiment *a*.]	0·325	0·214	0·2	Recovery.	*With physostigma*, none noted. The original size was $\frac{14}{50} \times \frac{13}{50}$. *After atropia*, the size was in 2 min., $\frac{18}{50} \times \frac{18}{50}$; in 20 min., $\frac{19}{50} \times \frac{19}{50}$; and in 1 hour 30 min., $\frac{18}{50} \times \frac{18}{50}$.—On the 3d day, it was $\frac{14}{50} \times \frac{13}{50}$.	*With physostigma*, in 4 min. 30 sec., slowing from 42 to 38 per 10 sec. *After atropia*, the rate per 10 sec. was in 1 hour 10 min., about 52; and in 1 hour 40 min., 48.—On the 3d day, it was 42.	*With physostigma*, none. The original rate was 42 per 10 sec. *After atropia*, the rate per 10 sec. was in 20 min., 29; in 1 hour 10 min., 19; and in 1 hour 33 min., 19.—On the 3d day, it was 20.	*With physostigma*, none. *After atropia*, in 2 min., slight increase in the secretion of certain buccal glands. There was no defæcation, urination, nor salivation during the 1 hour and 40 min. of continuous observation.	*With physostigma*, in 2 min., slight fibrillary twitches. *After atropia*, the fibrillary twitches soon became very well marked, and continued so for at least 1 hour and 40 min. In 13 min., distinct paralysis; and in 33 min., well-marked paralysis, which had somewhat lessened at 1 hour 40 min. Rarely, feeble tremors occurred.
b	3 lbs. 4 oz.	0·13 (= 0·12 gr. per 3 lbs.)	0	0	Death, in 18 min.	—	—	—	—	—
229. *a*	3 lbs. [Experiment *b* was performed ten days after experiment *a*.]	0·3	0·3	0·3	Recovery.	*With physostigma*, none noted. The original size was $\frac{13}{50} \times \frac{11}{50}$. *After atropia*, the size was in 3 min., $\frac{17}{50} \times \frac{17}{50}$; in 10 min., $\frac{19}{50} \times \frac{19}{50}$; and in 1 hour, $\frac{18}{50} \times \frac{18}{50}$.—On the following day, it was $\frac{17}{50} \times \frac{17}{50}$; on the 4th day, $\frac{18}{50} \times \frac{18}{50}$; and on the 7th day, $\frac{16}{50} \times \frac{9}{50}$.	*With physostigma*, in 4 min. 30 sec., slowing from 35 to 27 per 10 sec. *After atropia*, the rate per 10 sec. was in 6 min., 61; and in 48 min., 64.—On the following day, it was 25; and on the 3d day, 41.	*With physostigma*, none noted. The original rate was 18 per 10 sec. *After atropia*, the rate per 10 sec. was in 40 min., 23; and in 48 min., 18.—On the following day, it was 21; and on the 3d day, 18.	*With physostigma*, none. *After atropia*, in 1 min., slight increase in the secretion of certain buccal glands, which soon ceased. Rarely, moist laryngeal sounds accompanied the respirations. In 40 min., normal fæcal pellets were passed. There was no urination nor salivation during the 1 hour and 15 min. of continuous observation.	*With physostigma*, in 3 min., slight fibrillary twitches. *After atropia*, the fibrillary twitches became well marked, and continued so for at least 1 hour. In 15 min., slight paralysis; and in 20 min., well-marked paralysis, which had not obviously diminished at 1 hour 15 min. Occasionally, tremors occurred.
b	3 lbs. 4 oz.	0·13 (= 0·12 gr. p. 3 lbs.)	0	0	Death, in more than 1 hour 14 min.	—	—	—	—	—

Number of Experiment.	Weight of Rabbit.	Dose of Physostigma (in Grains). Actual Dose of Sul. of Physostigmia.	Doses of Sulphate of Atropia (in Grains). Actual Dose.	Doses of Sulphate of Atropia (in Grains). Dose p. 3 lbs. of Animal.	Result.	Effect on the Pupils. (The Measurements are in fiftieths of an inch.)	Effect on the Heart.	Effect on the Respirations.	Effect on Secretion and Excretion.	Effects on Motility, &c.
230. *a* [Experiment *b* was performed nine days after experiment *a*.]	3 lbs. 6 oz.	0·33	0·56	0·5	Recovery.	*With physostigma*, none. The original size was $\frac{12}{50} \times \frac{8}{50}$. *After atropia*, the size was in 8 min., $\frac{18}{50} \times \frac{16}{50}$; and in 2 hours, $\frac{17}{50} \times \frac{17}{50}$. —On the following day, it was $\frac{15}{50} \times \frac{14}{50}$; and on the 4th day, $\frac{8}{50} \times \frac{7}{50}$.	*With physostigma*, in 4 min. 30 sec., slowing from 38 to 29 per 10 sec. *After atropia*, the rate per 10 sec. was in 3 min., 56; in 50 min., 52; and in 1 hour 3 min., 51.—On the following day, it was 33; on the 3d day, 36; and on the 4th day, 40.	*With physostigma*, in 4 min., acceleration from 21 to 28 per 10 sec. *After atropia*, the rate per 10 sec. was in 4 min., 25; in 53 min., 14; and in 1 hour 3 min., 15.—On the following day, it was 14; and on the 3d day, 30.	*With physostigma*, none. *After atropia*, in 1 hour, a little urine was voided. There was no defæcation, salivation, nor increase in the secretion of any buccal gland during the 1 hour and 4 min. of continuous observation.	*With physostigma*, in 2 min., slight fibrillary twitchings. *After atropia*, the fibrillary twitches soon became well marked, but they had lessened somewhat in 1 hour. In 12 min., distinct paralysis; in 50 min., very well marked paralysis; and in 1 hour, well-marked paralysis. Frequently tremors occurred.
b	3 lbs. 4 oz.	0·13 (= 0·12 gr. p. 3 lbs.)	0	0	Death, in 20 min.	—	—	—	—	—
231. *a* [Experiment *b* was performed twelve days after experiment *a*.]	3 lbs.	0·3	0·6	0·6	Recovery.	*With physostigma*, none noted. The original size was $\frac{13}{50} \times \frac{12}{50}$. *After atropia*, the size was in 4 min., $\frac{15}{50} \times \frac{15}{50}$; in 20 min., $\frac{15}{50} \times \frac{14}{50}$; and in 1 hour 21 min., $\frac{15}{50} \times \frac{13}{50}$.—On the following day, it was $\frac{15}{50} \times \frac{13}{50}$; and on the 3d day, $\frac{14}{50} \times \frac{14}{50}$.	*With physostigma*, in 4 min. 30 sec., slowing from 39 to 32 per 10 sec. *After atropia*, the rate per 10 sec. was in 10 min., 58; in 1 hour 5 min., about 52; and in 1 hour 22 min., 43. —On the following day, it was 41.	*With physostigma*, in 3 min. 30 sec., slowing from 27 to 23 per 10 sec. *After atropia*, the rate per 10 sec. was in 26 min., 21; in 1 hour 4 min., 18; and in 1 hour 21 min., 24.—On the following day, it was 18.	*With physostigma*, none. *After atropia*, in 1 hour 18 min., several normal fæcal pellets were passed, and urine was voided. There was no salivation during the 1 hour and 24 min. of continuous observation.	*With physostigma*, in 2 min., slight fibrillary twitches. *After atropia*, the fibrillary twitches soon became well marked, and continued so for at least 1 hour 15 min. In 9 min., distinct paralysis; in 50 min., well-marked paralysis; and in 1 hour 24 min., distinct, though pretty lessened, paralysis. Frequently, tremors occurred.
b	3 lbs. 2 oz.	0·125 (= 0·12 gr. p. 3 lbs.)	0	0	Death, in 22 min.	—	—	—	—	—
232. *a* [Experiment *b* was performed ten days after experiment *a*.]	3 lbs. 8 oz.	0·35	0·81	0·7	Recovery.	*With physostigma*, none. The original size was $\frac{13}{50} \times \frac{13}{50}$. *After atropia*, the size was in 4 min., $\frac{16}{50} \times \frac{16}{50}$; in 20 min., $\frac{17}{50} \times \frac{17}{50}$; and in 2 hours 40 min., $\frac{18}{50} \times \frac{18}{50}$.—On the following day, it was $\frac{18}{50} \times \frac{18}{50}$; and on the 5th day, $\frac{18}{50} \times \frac{18}{50}$.	*With physostigma*, in 4 min., slowing from 37 to 31 per 10 sec. *After atropia*, the rate per 10 sec. was in 5 min., 60; and in 2 hours 14 min., 56.—On the following day, it was 26; on the 4th day, 32; and on the 5th day, 37.	*With physostigma*, none noted. The original rate was 12 per 10 sec. *After atropia*, the rate per 10 sec. was in 40 min., 14; in 1 hour, 11; in 1 hour 16 min., 9; in 1 hour 20 min., 12; and in 2 hours 15 min., 11. —On the following day, it was 12.	*With physostigma*, none. *After atropia*, in 2 hours, several normal fæcal pellets were passed. There was no urination nor salivation during the 2 hours and 40 min. of continuous observation.	*With physostigma*, in 1 min. 30 sec., slight fibrillary twitches. *After atropia*, the fibrillary twitches soon became very well marked, but they had lessened considerably in 2 hours. In 12 min., slight paralysis; in 1 hour 20 min., very well-marked paralysis; and in 2 hours 40 min., well-marked paralysis. Frequently, tremors and weak starts occurred.
b	3 lbs. 8 oz.	0·14 (= 0·12 gr. p. 3 lbs.)	0	0	Death, in 21 min.	—	—	—	—	—

Number of Experiment.	Weight of Rabbit.	Dose of Physostigma (in Grains). Actual Dose of Sul. of Physostigmia.	Doses of Sulphate of Atropia (in Grains). Actual Dose.	Doses of Sulphate of Atropia (in Grains). Dose p. 3 lbs. of Animal.	Result.	Effect on the Pupils. (The Measurements are in fiftieths of an inch.)	Effect on the Heart.	Effect on the Respirations.	Effect on Secretion and Excretion.	Effects on Motility, &c.
233. *a* [Experiment *b* was performed twelve days after experiment *a*.]	3 lbs. 7 oz.	0·34	0·91	0·8	Recovery.	*With physostigma*, none. The original size was $\frac{13}{50} \times \frac{13}{50}$. *After atropia*, the size was in 2 min., $\frac{15}{50} \times \frac{15}{50}$; in 9 min., $\frac{17}{50} \times \frac{17}{50}$; in 30 min., $\frac{14}{50} \times \frac{14}{50}$; in 1 hour 20 min., $\frac{13}{50} \times \frac{13}{50}$; and in 2 hours 35 min., $\frac{9}{50} \times \frac{8}{50}$.—On the following day, it was $\frac{15}{50} \times \frac{15}{50}$.	*With physostigma*, in 4 min. 30 sec., slowing from 37 to 29 per 10 sec. *After atropia*, the rate per 10 sec. was in 7 min., 54; in 1 hour 26 min., 34; and in 1 hour 50 min., 29.—On the following day, it was 25; on the 3d day, 33; and on the 4th day, 39.	*With physostigma*, none. The original rate was 10 per 10 sec. *After atropia*, the rate per 10 sec. was in 15 min., 20; in 41 min., 14; in 1 hour 20 min., 13; in 1 hour 26 min., 10; in 1 hour 50 min., 15; and in 2 hours 46 min., 19.—On the following day, it was 13.	*With physostigma*, none. *After atropia*, in 1 min., slight increase in the secretion of certain buccal glands, which ceased in a few minutes. In 29 min., in 1 hour 19 min., in 1 hour 54 min., and in 2 hours 19 min., several normal fæcal pellets were passed. In 1 hour 40 min., and in 2 hours 52 min., urine was voided. In 1 hour 50 min., salivation commenced, and continued at least 2 hours 55 min. In 2 hours 15 min., the respirations became noisy.	*With physostigma*, in 1 min. 20 sec., slight fibrillary twitches. *After atropia*, the fibrillary twitches soon became pretty well marked, and continued so until at least 2 hours 55 min. In 10 min., slight paralysis; in 1 hour 6 min., well-marked paralysis; and in 2 hours, almost no paralysis. Frequently weak tremors occurred; and at 2 hours 10 min., and 2 hours 34 min., feeble general convulsions took place.
b	3 lbs. 4 oz.	0·13 (= 0·12 gr. p. 3 lbs.)	0	0	Death, in 18 min.	—	—	—	—	—
234.	2 lbs. 12 oz.	0·275	0·75	0·8	Death, in more than 3 hours 22 min. and less than 24 hours after the administration of physostigma.	*With physostigma*, none. The original size was $\frac{15}{50} \times \frac{14}{50}$. *After atropia*, the size was in 5 min., $\frac{17}{50} \times \frac{17}{50}$; in 13 min., $\frac{12}{50} \times \frac{12}{50}$; and in 1 hour 53 min., $\frac{17}{50} \times \frac{17}{50}$.	*With physostigma*, in 4 min. 30 sec., slowing from 39 to 31 per 10 sec. *After atropia*, the rate per 10 sec. was in 43 min., 57; in 1 hour 8 min., 40; and in 1 hour 32 min., 44.	*With physostigma*, in 4 min., acceleration from 19 to 22 per 10 sec. *After atropia*, the rate per 10 sec. was in 12 min., 21; in 42 min., 20; in 1 hour 8 min., 13; and in 1 hour 32 min., 17.	*With physostigma*, none. *After atropia*, in 2 min., slight increase in the secretion of certain buccal glands, which ceased in a few minutes. In 1 hour 53 min., salivation occurred, and the respirations were occasionally noisy. There was no defæcation nor urination during the 3 hours 17 min. of continuous observation.	*With physostigma*, in 1 min. 30 sec., slight fibrillary twitches. *After atropia*, the fibrillary twitches soon became pretty well marked, and continued so for at least 2 hours. In 7 min., slight paralysis; and in 50 min., well-marked paralysis, which had not obviously lessened in 3 hours 10 min. Tremors and starts frequently occurred, and they could be excited by touching the animal.
235.	3 lbs. 5 oz.	0·33	0·99	0·9	Death, in 1 hour 3 min. after the administration of physostigma.	*With physostigma*, none. The original size was $\frac{14}{50} \times \frac{13}{50}$. *After atropia*, the size was in 10 min., $\frac{18}{50} \times \frac{18}{50}$; and in 58 min., $\frac{13}{50} \times \frac{13}{50}$.—After death, it was in 1 min., $\frac{12}{50} \times \frac{12}{50}$; in 5 min., $\frac{6}{50} \times \frac{6}{50}$; and in 46 min., $\frac{8}{50} \times \frac{7}{50}$.	*With physostigma*, in 4 min., slowing from 42 to 37 per 10 sec. *After atropia*, the rate per 10 sec. was in 8 min., 60; in 52 min., 46; in 54 min., 41; and in 56 min., 36.	*With physostigma*, none. The original rate was 32 per 10 sec. *After atropia*, the rate per 10 sec. was in 22 min., 32; in 42 min., 19; and in 51 min., 5. Afterwards, only infrequent gasping movements occurred, often non-rhythmical or imperfect.	*With physostigma*, none. *After atropia*, in 48 min., urine was voided. There was neither defæcation nor salivation.	*With physostigma*, in 1 min. 30 sec., slight fibrillary twitches. *After atropia*, the twitches soon become very well marked, but shortly before death they had lessened considerably. In 11 min., distinct paralysis; and in 50 min., general flaccidity. Occasionally feeble tremors occurred.—Rigor began to set in at about 45 min. after death (temp. of laboratory, 63° F.).

Number of Experiment.	Weight of Rabbit.	Dose of Physostigma (in Grains). Actual Dose of Sul. of Physostigmia.	Doses of Sulphate of Atropia (in Grains). Actual Dose.	Doses of Sulphate of Atropia (in Grains). Dose p. 3 lbs. of Animal.	Result.	Effect on the Pupils. (The Measurements are in fiftieths of an inch.)	Effect on the Heart.	Effect on the Respirations.	Effect on Secretion and Excretion.	Effects on Motility, &c.
236.	2 lbs. 14 oz.	0·287	0·95	1	Death, in 52 min. after the administration of physostigma.	*With physostigma*, none. The original size was $\frac{14}{50} \times \frac{13}{50}$. *After atropia*, the size was in 2 min. 30 sec., $\frac{13}{50} \times \frac{13}{50}$; in 18 min., $\frac{19}{50} \times \frac{19}{50}$; and in 47 min., $\frac{12}{50} \times \frac{12}{50}$.—After death, it was in 1 min., $\frac{17}{50} \times \frac{17}{50}$; and in 2 min., $\frac{18}{50} \times \frac{18}{50}$; in 8 min., $\frac{14}{50} \times \frac{14}{50}$; and in 24 min., $\frac{14}{50} \times \frac{14}{50}$.	*With physostigma*, in 4 min., slowing from 42 to 29 per 10 sec. *After atropia*, the rate per 10 sec. was in 4 min., 53; and in 45 min., 36.	*With physostigma*, none. The original rate was 13 per 10 sec. *After atropia*, the rate per 10 sec. was in 16 min., 15; in 23 min., 13; and in 40 min., 6. Afterwards only rare and laboured gasps occurred.	*With physostigma*, in 4 min., slight increase in the secretion of certain buccal glands. *After atropia*, in 30 sec., slight increase in the secretion of certain buccal glands, which ceased in a few minutes. There was no defæcation, urination, nor salivation.	*With physostigma*, in 1 min. 30 sec., slight fibrillary twitches. *After atropia*, the twitches soon became pretty well marked, but they altogether ceased before death. In 8 min., slight paralysis; and in 40 min., general flaccidity. Frequently tremors and starts occurred.
237.	3 lbs.	0·3	1·5	1·5	Death, in 58 min. after the administration of physostigma.	*With physostigma*, in 3 min., dilatation from $\frac{11}{50} \times \frac{10}{50}$ to $\frac{13}{50} \times \frac{12}{50}$. *After atropia*, the size was in 2 min., $\frac{15}{50} \times \frac{15}{50}$; and in 52 min., $\frac{17}{50} \times \frac{17}{50}$. —After death, it was in 2 min., $\frac{15}{50} \times \frac{15}{50}$; and in 10 min, $\frac{10}{50} \times \frac{9}{50}$.	*With physostigma*, in 4 min., slowing from 40 to 32 per 10 sec. *After atropia*, the rate per 10 sec. was in 3 min., 48.	*With physostigma*, none. The original rate was 12 per 10 sec. *After atropia*, the rate per 10 sec. was in 3 min., 13; in 34 min., 19; and in 41 min., 6. Afterwards, only infrequent gasps took place.	*With physostigma*, none. *After atropia*, in 1 min., slight increase in the secretion of certain buccal glands, which ceased in a few minutes. There was no defæcation, urination, nor salivation.	*With physostigma*, in 2 min., slight fibrillary twitches. *After atropia*, the fibrillary twitches remained only slightly marked. In 3 min., slight paralysis; and in 35 min., general flaccidity. Rarely, some feeble tremors occurred.

SERIES II.—*continued.*

TABLE 6.—EXPERIMENTS WITH THREE TIMES THE MINIMUM-LETHAL DOSE OF PHYSOSTIGMA (0·36 *gr. of Sulphate of Physostigmia per Three Pounds Weight of Rabbit*).

Number of Experiment.	Weight of Rabbit.	Dose of Physostigma (in Grains). Actual Dose of Sul. of Physostigmia.	Doses of Sulphate of Atropia (in Grains). Actual Dose.	Doses of Sulphate of Atropia (in Grains). Dose p. 3 lbs. of Animal.	Result.	Effect on the Pupils. (The Measurements are in fiftieths of an inch.)	Effect on the Heart.	Effect on the Respirations.	Effect on Secretion and Excretion.	Effects on Motility, &c.
238.	3 lbs. 6 oz.	0·405	0·11	0·1	Death, in 1 hour 2 min. after the administration of physostigma.	*With physostigma*, none. The original size was $\frac{15}{50} \times \frac{14}{50}$. *After atropia*, the size was in 2 min., $\frac{17}{50} \times \frac{17}{50}$; in 28 min., $\frac{15}{50} \times \frac{14}{50}$; in 35 min., $\frac{13}{50} \times \frac{11}{50}$; and in 44 min., $\frac{13}{50} \times \frac{11}{50}$.	*With physostigma*, in 4 min., slowing from 43 to 36 per 10 sec. *After atropia*, the rate per 10 sec. was in 2 min. 30 sec., 44; in 29 min., 37; and in 52 min., 17.	*With physostigma*, none. The original rate was 34 per 10 sec. *After atropia*, the rate per 10 sec. was in 27 min., 10; in 34 min., 14; and in 40 min., 7. Afterwards only feeble and irregular gasps occurred.	*With physostigma*, none. *After atropia*, in 1 min., slight increase in the secretion of certain buccal glands, which ceased in a few minutes. There was no defæcation, urination, nor salivation.	*With physostigma*, in 1 min. 30 sec., slight fibrillary twitches. *After atropia*, the twitches soon became well marked, but in 35 min. they had greatly lessened. In 20 min., very well-marked paralysis; and in 30 min., general flaccidity. Frequently tremors and irregular movements, suggestive of dyspnœa, occurred.—After death, the first appearance of rigor was in 1 hour 30 min. (temp. of laboratory, 62° F.).

Number of Experiment.	Weight of Rabbit.	Dose of Physostigma (in Grains). Actual Dose of Sul. of Physostigmia.	Doses of Sulphate of Atropia (in Grains). Actual Dose.	Doses of Sulphate of Atropia (in Grains). Dose p. 3 lbs. of Animal.	Result.	Effect on the Pupils. (The Measurements are in fiftieths of an inch.)	Effect on the Heart.	Effect on the Respirations.	Effect on Secretion and Excretion.	Effects on Motility, &c.
239.	3 lbs.	0·36	0·15	0·15	Death, in 33 min. after the administration of physostigma.	*With physostigma*, none noted. The original size was $\frac{12}{50} \times \frac{11}{50}$. *After atropia*, the size was in 2 min. 30 sec., $\frac{15}{50} \times \frac{14}{50}$; in 9 min., $\frac{17}{50} \times \frac{17}{50}$; in 18 min., $\frac{9}{50} \times \frac{8}{50}$; and in 28 min., $\frac{3}{50} \times \frac{3}{50}$.—After death, it was in 1 min. 30 sec., $\frac{6}{50} \times \frac{5}{50}$; in 2 min., $\frac{5}{50} \times \frac{4}{50}$; in 15 min., $\frac{7}{50} \times \frac{6}{50}$; and in 20 min., $\frac{10}{50} \times \frac{9}{50}$.	*With physostigma*, in 4 min., slowing from 42 to 38 per 10 sec. *After atropia*, the rate per 10 sec. was in 4 min., 50. Further observations were not made, as the attempts to make them interfered greatly with the respiratory movements.	*With physostigma*, none. The original rate was 17 per 10 sec. *After atropia*, the respirations soon became very laboured and infrequent.	*With physostigma*, none. *After atropia*, in 2 min., slight increase in the secretion of certain buccal glands, which ceased in a few minutes. In 25 min., several normal fæcal pellets were formed. There was no urination nor salivation.	*With physostigma*, in 1 min. 30 sec., slight fibrillary twitches; and in 4 min. 30 sec., pretty well marked and more general twitches. *After atropia*, the fibrillary twitches soon became very well marked, and they continued, though in a diminished form, until about 15 min. after death. In 4 min., extension of the limbs; in 8 min., distinct paralysis; and in 14 min., general flaccidity. Frequently tremors and feeble spasms occurred.—After death, the first appearance of rigor was in 25 min. (temp. of laboratory, 59° F.).
240. *a*	3 lbs. 2 oz.	0·37	0·17	0·16	Recovery.	*With physostigma*, none noted. The original size was $\frac{15}{50} \times \frac{13}{50}$. *After atropia*, the size was in 15 min., $\frac{16}{50} \times \frac{16}{50}$; and in 1 hour 35 min., $\frac{16}{50} \times \frac{16}{50}$.—On the following day, it was $\frac{18}{50} \times \frac{18}{50}$; and on the 4th day, $\frac{16}{50} \times \frac{15}{50}$.	*With physostigma*, none noted. The original rate was 38 per 10 sec. *After atropia*, none noted, until the following day when the rate per 10 sec. was 32. On the 3d day it was 39.	*With physostigma*, none noted. The original rate was 19 per 10 sec. *After atropia*, the rate per 10 sec. was in 24 min., 16; in 50 min., 15; and in 1 hour 30 min., 14.	*With physostigma*, none. *After atropia*, in 7 min., increase in the secretion of certain buccal glands, causing noisy respiration. In 17 min., no sounds with respiration; in 38 min., moist sounds with respiration; and in 50 min., no sounds. There was no defæcation, urination, nor salivation during the 2 hours and 20 min. of continuous observation.	*With physostigma*, in 2 min., slight fibrillary twitches, which had become more marked in 4 min. *After atropia*, the fibrillary twitches soon became well marked, and continued so for more than 2 hours. In 2 min., extension of the limbs; in 5 min., slight paralysis; in 50 min., very well-marked paralysis; and in 2 hours 15 min., well-marked, though somewhat diminished, paralysis. Frequently tremors and feeble spasms occurred.
b	3 lbs. 4 oz.	0·13 (= 0·12 gr. p. 3 lbs.)	0	0	Death, in 16 min.	—	—	—	—	—
241.	3 lbs. 3 oz.	0·37	0·23	0·2	Death, in 53 min. after the administration of physostigma.	*With physostigma*, in 3 min 30 sec., dilatation from $\frac{14}{50} \times \frac{14}{50}$ to $\frac{15}{50} \times \frac{15}{50}$. *After atropia*, the size was in 2 min., $\frac{17}{50} \times \frac{17}{50}$; in 25 min., $\frac{13}{50} \times \frac{13}{50}$; and in 48 min., $\frac{12}{50} \times \frac{12}{50}$.—After death, it was in 1 min., $\frac{12}{50} \times \frac{12}{50}$; in 5 min., $\frac{13}{50} \times \frac{13}{50}$; and in 22 min., $\frac{14}{50} \times \frac{14}{50}$.	*With physostigma*, in 3 min. 50 sec., slowing from 42 to 32 per 10 sec. *After atropia*, the rate per 10 sec. was in 1 min. 30 sec., 49; in 4 min., 52; in 8 min., 57; in 40 min., 48; in 43 min., 37; and in 46 min., 36.	*With physostigma* none. The original rate was 24 per 10 sec. *After atropia*, the rate per 10 sec. was in 7 min., 23; in 33 min., 18; in 37 min., 10; in 42 min., 6; and in 44 min., 4. Afterwards, only feeble gasps occurred irregularly until death.	*With physostigma*, none. *After atropia*, in 3 min., slight increase in the secretion of certain buccal glands; and in 25 min., so great increase as to produce noisy respiration, which occurred at intervals until death. There was no defæcation, urination, nor salivation.	*With physostigma*, in 1 min., 30 sec., slight and infrequent fibrillary twitches; and in 4 min., uneasy movements. *After atropia*, the fibrillary twitches soon became very well marked; they afterwards became less marked, but continued until a few minutes after death. In 6 min., slight extension of the limbs; in 8 min., slight paralysis; and in 36 min., general flaccidity. Frequently, tremors occurred.—After death, there was no rigor in 30 min. (temp. of laboratory, 59° F.).

[Experiment *b* was performed thirteen days after experiment *a*.]

Number of Experiment.	Weight of Rabbit.	Dose of Physostigma (in Grains). Actual Dose of Sul. of Physostigmia.	Doses of Sulphate of Atropia (in Grains). Actual Dose.	Doses of Sulphate of Atropia (in Grains). Dose p. 3 lbs. of Animal.	Result.	Effect on the Pupils. (The Measurements are in fiftieths of an inch.)	Effect on the Heart.	Effect on the Respirations.	Effect on Secretion and Excretion.	Effects on Motility &c.
242.	3 lbs. 4 oz.	0·39	0·27	0·25	Death, in 22 min. after the administration of physostigma.	*With physostigma*, in 3 min. 30 sec., dilatation from $\frac{14}{50} \times \frac{13}{50}$ to $\frac{18}{50} \times \frac{18}{50}$. *After atropia*, the size was in 3 min., $\frac{17}{50} \times \frac{17}{50}$; and in 17 min., $\frac{17}{50} \times \frac{17}{50}$; —After death, it was in 2 min., $\frac{12}{50} \times \frac{12}{50}$; in 8 min., $\frac{9}{50} \times \frac{8}{50}$; in 19 min., $\frac{11}{50} \times \frac{11}{50}$; and in 1 hour 22 min., $\frac{14}{50} \times \frac{13}{50}$.	*With physostigma*, in 4 min. 30 sec., slowing from 40 to 29 per 10 sec. *After atropia*, the rate per 10 sec. was in 15 min., 46.	*With physostigma*, in 4 min., acceleration from 28 to 42 per 10 sec. *After atropia*, the rate per 10 sec. was in 4 min., 36; in 11 min., 20; in 13 min., 14; in 15 min., 11; and in 16 min., 10.	*With physostigma*, in 4 min. 30 sec., slight increase in the secretion of certain buccal glands. *After atropia*, none. There was no defæcation, urination, nor salivation.	*With physostigma*, in 2 min., slight and infrequent fibrillary twitches. *After atropia*, the fibrillary twitches soon became very well marked; they afterwards diminished, but continued until about 7 min. after death. In 1 min., extension of the limbs; in 5 min., distinct paralysis; and in 15 min., general flaccidity. Frequently, tremors and feeble spasms occurred.—After death, rigor first began to set in at 50 min. (temp. of laboratory, 63° F.).
243.	3 lbs.	0·36	0·3	0·3	Death, in 1 hour 22 min. after the administration of physostigma.	*With physostigma*, none. The original size was $\frac{13}{50} \times \frac{13}{50}$. *After atropia*, the size was in 2 min., $\frac{15}{50} \times \frac{15}{50}$; in 30 min., $\frac{19}{50} \times \frac{9}{50}$; in 35 min., $\frac{9}{50} \times \frac{8}{50}$; in 1 hour, $\frac{8}{50} \times \frac{7}{50}$; and in 1 hour 13 min., $\frac{6}{50} \times \frac{6}{50}$. —After death, it was in 1 min., $\frac{6}{50} \times \frac{5}{50}$; in 32 min., $\frac{6}{50} \times \frac{5}{50}$; in 42 min., $\frac{7}{50} \times \frac{6}{50}$; in 58 min., $\frac{8}{50} \times \frac{7}{50}$; and in 1 hour 10 min., $\frac{19}{50} \times \frac{10}{50}$.	*With physostigma*, none noted. The original rate was 42 per 10 sec. *After atropia*, the rate per 10 sec. was in 6 min., 56; in 36 min., 57; and in 1 hour 4 min., 35.	*With physostigma*, none noted. The original rate was 32 per 10 sec. *After atropia*, the rate per 10 sec. was in 10 min., 20; in 36 min., 10; in 50 min., 6; and in 1 hour 4 min., 5. Afterwards feeble gasps occurred irregularly until death.	*With physostigma*, none noted. *After atropia*, in 1 hour 10 min., slight salivation; and after this, twice the feeble respiratory gasps were accompanied with moist sounds. There was no defæcation nor urination.	*With physostigma* in 1 min. 30 sec., slight and infrequent fibrillary twitches. *After atropia*, the fibrillary twitches soon became well marked, and they were present, though in only a slight form, until 8 min. after death. In 2 min., extension of the limbs; in 4 min., slight paralysis; and in 35 min., general flaccidity. Frequently, tremors and feeble spasms occurred.—Rigor first began to set in at about 1 hour after death (temp. of laboratory, 61° F.).
244.	3 lbs. 2 oz.	0·37	0·52	0·5	Death, in more than 1 hour 10 min. after the administration of physostigma.	*With physostigma*, none noted. The original size was $\frac{14}{50} \times \frac{13}{50}$. *After atropia*, the size was in 12 min., $\frac{18}{50} \times \frac{18}{50}$; and in 1 hour 5 min., $\frac{18}{50} \times \frac{18}{50}$.—After death, on the following day the size was $\frac{17}{50} \times \frac{16}{50}$.	*With physostigma*, in 4 min., slowing from 40 to 32 per 10 sec. *After atropia*, the rate per 10 sec. was in 3 min., 48; in 10 min., 57; and in 35 min., 55.	*With physostigma*, none. The original rate was 16 per 10 sec. *After atropia*, the rate per 10 sec. was in 8 min., 21; and in 52 min., 12.	*With physostigma*, none. *After atropia*, in 2 min., slight increase in the secretion of certain buccal glands, which ceased in a few minutes. There was no defæcation, urination, nor salivation.	*With physostigma*, in 2 min., slight and infrequent fibrillary twitches; and in 4 min. 30 sec., uneasy movements. *After atropia*, the fibrillary twitches soon became well marked, and they were frequent, though in a diminished form, at 1 hour. In 2 min., extension of the limbs; and in 1 hour, general flaccidity. Frequently, tremors and pretty strong spasms occurred.

TABLE 7.—EXPERIMENTS WITH THREE AND A HALF TIMES THE MINIMUM-LETHAL DOSE OF PHYSOSTIGMA (0·42 *gr. of Sulphate of Physostigmia per Three Pounds Weight of Rabbit*).

Number of Experiment.	Weight of Rabbit.	Dose of Physostigma (in Grains). Actual Dose of Sul. of Physostigmia.	Doses of Sulphate of Atropia (in Grains). Actual Dose.	Doses of Sulphate of Atropia (in Grains). Dose p. 3 lbs. of Animal.	Result.	Effect on the Pupils. (The Measurements are in fiftieths of an inch.)	Effect on the Heart.	Effect on the Respirations.	Effect on Secretion and Excretion.	Effects on Motility, &c.
245.	3 lbs. 5 oz.	0·46	0·17	0·16	Death, in 22 min. after the administration of physostigma.	*With physostigma*, in 4 min., dilatation from $\frac{15}{50} \times \frac{14}{50}$ to $\frac{16}{50} \times \frac{15}{50}$. *After atropia*, the size was in 8 min., $\frac{9}{50} \times \frac{8}{50}$; in 10 min., $\frac{7}{50} \times \frac{6}{50}$; in 15 min., $\frac{12}{50} \times \frac{12}{50}$; and in 16 min. 30 sec., $\frac{9}{50} \times \frac{8}{50}$.—After death, it was in 30 sec., $\frac{8}{50} \times \frac{5}{50}$; in 1 min., $\frac{5}{50} \times \frac{4}{50}$; in 8 min., $\frac{6}{50} \times \frac{5}{50}$; in 23 min., $\frac{9}{50} \times \frac{8}{50}$; and in 36 min., $\frac{12}{50} \times \frac{12}{50}$.	*With physostigma*, in 4 min. 30 sec., slowing from 32 to 27 per 10 sec. *After atropia*, the rate per 10 sec. was in 8 min., 36; and in 15 min. 30 sec., 19.	*With physostigma*, in 3 min. 50 sec., acceleration from 14 to 18 per 10 sec. *After atropia*, in 3 min., the respirations became noisy; in 8 min., they were gasping, infrequent, impeded by mucus, and irregular; and they continued so until death.	*With physostigma*, none. *After atropia*, in 1 min., the secretion of certain buccal glands was increased; and in 14 min. salivation occurred. In 11 min., normal fæcal pellets were passed. There was no urination.	*With physostigma*, in 2 min., slight and infrequent fibrillary twitches; and in 4 min., uneasy movements. *After atropia*, the fibrillary twitches soon became pretty well marked, and they continued for some minutes after death. In 1 min., extension of the limbs; and in 6 min., general flaccidity. Occasionally, feeble tremors occurred.—After death, rigor had not commenced at 36 min.
246.	3 lbs.	0·42	0·2	0·2	Death, in 24 min. after the administration of physostigma.	*With physostigma*, in 3 min., dilatation from $\frac{9}{50} \times \frac{8}{50}$ to $\frac{12}{50} \times \frac{9}{50}$. *After atropia*, the size was in 2 min. $\frac{7}{50} \times \frac{6}{50}$.; in 4 min., $\frac{8}{50} \times \frac{4}{50}$; and in 19 min., $\frac{5}{50} \times \frac{4}{50}$.—After death, it was in 1 min., $\frac{8}{50} \times \frac{7}{50}$; in 11 min., $\frac{5}{50} \times \frac{4}{50}$; and in 54 min., $\frac{6}{50} \times \frac{5}{50}$.	*With physostigma*, in 3 min. 30 sec., slowing from 37 to 22 per 10 sec. *After atropia*, the rate per 10 sec. was in 6 min., 19; in 7 min., 14; in 8 min., 46; in 10 min., 58; in 12 min., 45; in 14 min., 16; in 16 min., 30; and in 18 min., 24.	*With physostigma*, in 4 min., slowing from 24 to 22 per 10 sec. *After atropia*, in 3 min., the rate per 10 sec. was 19; but the movements soon after became greatly obstructed by mucus; and from 7 min. until death, they consisted of gasps, which were of very irregular occurrence.	*With physostigma*, none. *After atropia*, in 4 min., the secretion of certain buccal glands was increased; and in 12 min., salivation occurred. There was no defæcation nor urination.	*With physostigma*, in 1 min. 10 sec., slight and infrequent fibrillary twitches; in 3 min. 40 sec., uneasy movements; and in 4 min. 30 sec., extension of the limbs. *After atropia*, the fibrillary twitches soon became pretty well marked, and they continued for several minutes after death. In 2 min., distinct paralysis; and in 6 min., general flaccidity. Tremors frequently occurred.—Rigor began to set in at about 1 hour after death (temp. of laboratory, 68° F.).

SERIES III.—DETERMINATION OF THE LIMITS OF ANTAGONISM WHEN THE DOSE OF PHYSOSTIGMA IS CONSTANT (ONE AND A HALF TIMES THE MINIMUM-LETHAL DOSE), WHILE THE DOSE OF ATROPIA AND THE INTERVAL OF TIME BETWEEN THE ADMINISTRATION OF THE TWO SUBSTANCES VARY.

TABLE 1.—Experiments in which Atropia and Physostigma were administered simultaneously.

Number of Experiment.	Weight of Rabbit.	Doses of Sulphate of Atropia (in Grains). Actual Dose.	Doses of Sulphate of Atropia (in Grains). Dose p. 3 lbs. of Animal	Dose of Physostigma (in Grains). Actual Dose of Sul. of Physostigmia.	Result.	Effect on the Pupils. (The Measurements are in fiftieths of an inch.)	Effect on the Heart.	Effect on the Respirations.	Effect on Secretion and Excretion.	Effects on Motility, &c.
247.	3 lbs.	0·02	0·02	0·18	Death, in 49 min. after the commencement of the experiment.	*Before the experiment*, the size was $\frac{11}{50} \times \frac{10}{50}$. *After atropia and physostigma*, the size was in 3 min., $\frac{11}{50} \times \frac{10}{50}$; in 7 min., $\frac{15}{50} \times \frac{15}{50}$; in 14 min., $\frac{17}{50} \times \frac{17}{50}$; in 27 min., $\frac{14}{50} \times \frac{14}{50}$; in 35 min., $\frac{10}{50} \times \frac{10}{50}$; and in 48 min., $\frac{10}{50} \times \frac{10}{50}$.—After death, it was in 4 min., $\frac{10}{50} \times \frac{10}{50}$; in 18 min., $\frac{10}{50} \times \frac{10}{50}$; and in 1 hour, $\frac{11}{50} \times \frac{10}{50}$.	*Before the experiment*, the rate was 39 per 10 sec. *After atropia and physostigma*, the rate per 10 sec. was in 2 min., 39; in 5 min., 45; in 7 min., 33; in 27 min., 28; in 32 min., 30; in 37 min., 23; in 44 min., 19; and in 46 min., 21.	*Before the experiment*, the rate was 21 per 10 sec. *After atropia and physostigma*, the rate per 10 sec. was in 4 min., 17; in 23 min., 22; in 27 min., 13; in 32 min; 6; and in 37 min., 4. Afterwards, only gasps occurred irregularly until death.	— *After atropia and physostigma*, in 7 min., slight increase of the secretion of certain buccal glands, which ceased in a few minutes. In 23 min. and 37 min., several normal fæcal pellets were passed. There was neither urination nor salivation.	— *After atropia and physostigma*, in 1 min., infrequent fibrillary twitches, which soon became well marked, but nearly ceased shortly before death. In 7 min., extension of the limbs; in 14 min., slight paralysis; and in 25 min., general flaccidity. Feeble tremors occurred frequently. — Rigor began to set in at about 1 hour after death (temp. of laboratory, 60° F.).
248.	3 lbs.	0·02	0·02	0·18	Death, in 30 min. 30 sec. after the commencement of the experiment.	*Before the experiment*, the size was $\frac{15}{50} \times \frac{14}{50}$. *After atropia and physostigma*, the size was in 4 min., $\frac{13}{50} \times \frac{13}{50}$; in 8 min., $\frac{17}{50} \times \frac{16}{50}$; in 12 min., $\frac{11}{50} \times \frac{11}{50}$; in 15 min., $\frac{7}{50} \times \frac{6}{50}$; in 27 min., $\frac{6}{50} \times \frac{6}{50}$; in 28 min., $\frac{11}{50} \times \frac{11}{50}$; and in 29 min., $\frac{11}{50} \times \frac{10}{50}$.—After death, it was in 1 min., $\frac{9}{50} \times \frac{8}{50}$; in 3 min., $\frac{10}{50} \times \frac{10}{50}$; and in 17 min., $\frac{11}{50} \times \frac{10}{50}$.	*Before the experiment*, the rate was 40 per 10 sec. *After atropia and physostigma*, the rate per 10 sec. was in 3 min., 41; in 5 min., 45; in 7 min., 37; in 10 min., 32; in 12 min., 28; in 14 min., 16; in 17 min., 18; and in 21 min., 20. Afterwards, the cardiac impulse was indistinguishable.	*Before the experiment*, the rate was 20 per 10 sec. *After atropia and physostigma*, the rate per 10 sec. was in 2 min., 17; in 4 min., 21; in 11 min., 17; in 14 min., 8; in 21 min., 16; and in 27 min., 9. Afterwards, only gasps occurred irregularly until death.	— *After atropia and physostigma*, in 10 min., several normal fæcal pellets; in 17 min., salivation; and in 22 min., increased lachrymation.	— *After atropia and physostigma*, in 3 min., slight fibrillary twitches, which soon became well marked, and continued until more than 10 min. after death. In 9 min., slight paralysis; and in 12 min., general flaccidity.

Number of Experiment.		Weight of Rabbit.	Doses of Sulphate of Atropia (in Grains). Actual Dose.	Doses of Sulphate of Atropia (in Grains). Dose p. 3 lbs. of Animal.	Dose of Physostigma (in Grains). Actual Dose of Sul. of Physostigmia.	Result.	Effect on the Pupils. (The Measurements are in fiftieths of an inch.)	Effect on the Heart.	Effect on the Respirations.	Effect on Secretion and Excretion.	Effects on Motility, &c.
249.	*a*	3 lbs. [Experiment *b* was performed seven days after experiment *a*.]	0·05	0·05	0·18	Recovery.	*Before the experiment*, the size was $\frac{18}{50} \times \frac{8}{50}$. *After atropia and physostigma*, the size was in 6 min., $\frac{15}{50} \times \frac{15}{50}$; in 17 min., $\frac{12}{50} \times \frac{12}{50}$; in 23 min., $\frac{14}{50} \times \frac{14}{50}$; and in 2 hours, $\frac{18}{50} \times \frac{18}{50}$.—On the 3d day, it was $\frac{13}{50} \times \frac{13}{50}$.	*Before the experiment*, the rate was 37 per 10 sec. *After atropia and physostigma*, the rate per 10 sec. was in 3 min., 46; in 6 min., 41; in 47 min., 50; in 1 hour 10 min., 48; and in 1 hour 50 min., 44.—On the 3d day, it was 37.	*Before the experiment*, the rate was 14 per 10 sec. *After atropia and physostigma*, the rate per 10 sec. was in 17 min., 18; in 23 min., 15; in 47 min., 11; in 1 hour 9 min., 13; and in 1 hour 52 min., 15.—On the 3d day, it was 12.	— *After atropia and physostigma*, in 6 min., slight increase in the secretion of certain buccal glands, which soon ceased. There was no defæcation, urination, nor salivation during the 2 hours of continuous observation.	— *After atropia and physostigma*, in 2 min., slight fibrillary twitches, which soon became very well marked, and continued so for more than 1 hour 30 min. In 16 min., slight weakness; in 40 min., decided paralysis; and in 1 hour 25 min., only slight paralysis. Occasionally feeble tremors occurred.
	b	2 lbs. 15 oz.	0	0	0·12 (= nearly 0·12 gr. p. 3 lbs.)	Death, in 17 min. 30 sec.	—	—	—	—	—
250.	*a*	3 lbs. 3 oz. [Experiment *b* was performed twelve days after experiment *a*.]	0·53	0·5	0·19	Recovery.	*Before the experiment*, the size was $\frac{12}{50} \times \frac{11}{50}$. *After atropia and physostigma*, the size was in 1 min., $\frac{14}{50} \times \frac{14}{50}$; in 6 min., $\frac{17}{50} \times \frac{17}{50}$; in 38 min., $\frac{16}{50} \times \frac{16}{50}$; and in 1 hour 40 min., $\frac{14}{50} \times \frac{13}{50}$. —On the following day, it was $\frac{15}{50} \times \frac{14}{50}$; and on the 3d day, $\frac{12}{50} \times \frac{11}{50}$.	*Before the experiment*, the rate was 40 per 10 sec. *After atropia and physostigma*, the rate per 10 sec. was in 2 min., 54; in 19 min., 50; in 28 min., 51; in 46 min., 45; in 1 hour 6 min., 34; and in 1 hour 41 min., 32.—On the following day, it was 35; and on the 3d day, 40.	*Before the experiment*, the rate was 18 per 10 sec. *After atropia and physostigma*, the rate per 10 sec. was in 4 min., 18; in 46 min., 16; in 1 hour 4 min., 17; and in 1 hour 45 min., 15.—On the following day, it was 20; and on the 3d day, 16.	— *After atropia and physostigma*, in 31 min., and several times afterwards, normal fæcal pellets were passed; and in 1 hour 44 min., wet fæces. In 56 min., urine was voided freely. In 1 hour 47 min., the secretion of certain buccal glands was increased, and then the respirations were at times noisy.	— *After atropia and physostigma*, in 2 min., slight fibrillary twitches, which soon became very well marked, and continued so for more than 1 hour 40 min. There was no paralysis until 1 hour 5 min., when the limbs yielded slightly during movements, but this unimportant weakness had not increased at 1 hour 50 min. There were no tremors during the 2 hours of continuous observation.
	b	3 lbs. 4 oz.	0	0	0·13 (= 0·12 gr. p. 3 lbs.)	Death, in 21 min.	—	—	—	—	—
251.	*a*	3 lbs. 10 oz. [Experiment *b* was performed eleven days after experiment *a*.]	1·2	1	0·22	Recovery.	*Before the experiment*, the size was $\frac{18}{50} \times \frac{18}{50}$. *After atropia and physostigma*, the size was in 10 min., $\frac{15}{50} \times \frac{15}{50}$; and in 1 hour 20 min., $\frac{18}{50} \times \frac{18}{50}$. —On the following day, it was $\frac{15}{50} \times \frac{15}{50}$; and on the 12th day, $\frac{18}{50} \times \frac{18}{50}$.	*Before the experiment*, the rate was 42 per 10 sec. *After atropia and physostigma*, the rate per 10 sec. was in 2 min., 47; in 5 min., 43; in 9 min., 41; in 25 min., 44; in 40 min., 48; and in 1 hour 20 min., 44.—On the following day, it was 39; and on the 12th day, 39.	*Before the experiment*, the rate was 27 per 10 sec. *After atropia and physostigma*, the rate per 10 sec. was in 9 min., 31; in 26 min., 23; and in 1 hour 19 min., 21.—On the following day, it was 30.	— *After atropia and physostigma*, none. There was no defæcation, urination, nor salivation during the 1 hour 30 min. of continuous observation.	— *After atropia and physostigma*, in 1 min., slight fibrillary twitches, which became very well marked, and continued so for more than 1 hour 20 min. In 13 min., slight paralysis; in 17 min., well-marked paralysis; and in 1 hour 20 min., only slight paralysis. Tremors occurred frequently, and occasionally there were some feeble spasms.
	b	3 lbs. 12 oz.	0	0	0·15 (= 0·12 gr. p. 3 lbs.)	Death, in 29 min.	—	—	—	—	—

Number of Experiment.	Weight of Rabbit.	Doses of Sulphate of Atropia (in Grains). Actual Dose.	Doses of Sulphate of Atropia (in Grains). Dose p. 3 lbs. of Animal.	Dose of Physostigma (in Grains). Actual Dose of Sul. of Physostigmia.	Result.	Effect on the Pupils. (The Measurements are in fiftieths of an inch.)	Effect on the Heart.	Effect on the Respirations.	Effect on Secretion and Excretion.	Effects on Motility, &c.
252. *a* [Experiment *b* was performed eleven days after experiment *a*.]	3 lbs. 3 oz.	1·6	1·5	0·19	Recovery.	*Before the experiment*, the size was $\frac{13}{50} \times \frac{13}{50}$. *After atropia and physostigma*, the size was in 1 min., $\frac{14}{50} \times \frac{14}{50}$; in 14 min., $\frac{17}{50} \times \frac{17}{50}$; and in 2 hours 10 min., $\frac{17}{50} \times \frac{17}{50}$.—On the following day, it was $\frac{17}{50} \times \frac{17}{50}$; and on the 12th day, $\frac{14}{50} \times \frac{14}{50}$.	*Before the experiment*, the rate was 43 per 10 sec. *After atropia and physostigma*, the rate per 10 sec. was in 2 min., 54; in 4 min., 48; in 10 min., 51; in 35 min., 51; in 1 hour 25 min., 42; and in 2 hours 10 min., 42.—On the following day, it was 31; on the 4th day, 38; and on the 12th day, 39.	*Before the experiment*, the rate was 30 per 10 sec. *After atropia and physostigma*, the rate per 10 sec. was in 5 min., 24; in 15 min., 32; in 52 min., 26; and in 2 hours 11 min., 24.—On the following day, it was 16.	— *After atropia and physostigma*, none. There was no defæcation, urination, nor salivation during the 2 hours 20 min. of continuous observation.	— *After atropia and physostigma*, in 2 min., slight fibrillary twitches, which soon became more marked, but again became only slight after 27 min. In 15 min., slight paralysis; in 19 min., well-marked paralysis; and in 2 hours 10 min., only slight paralysis. There were no distinct tremors.
	b 3 lbs. 2 oz.	0	0	0·13 (= 0·12 gr. p. 3 lbs.)	Death, in 34 min.	—	—	—	—	—
253. *a* [Experiment *b* was performed nine days after experiment *a*.]	3 lbs.	2	2	0·18	Recovery.	*Before the experiment*, the size was $\frac{14}{50} \times \frac{13}{50}$. *After atropia and physostigma*, the size was in 2 min., $\frac{17}{50} \times \frac{17}{50}$; and in 2 hours 5 min., $\frac{17}{50} \times \frac{17}{50}$.—On the following day, it was $\frac{18}{50} \times \frac{18}{50}$; and on the 10th day, $\frac{18}{50} \times \frac{18}{50}$.	*Before the experiment*, the rate was 42 per 10 sec. *After atropia and physostigma*, the rate per 10 sec. was in 7 min., 46; in 1 hour, about 50; and in 2 hours 10 min., about 50.—On the following day, it was 34; and on the 6th day, 41.	*Before the experiment*, the rate was 19 per 10 sec. *After atropia and physostigma*, the rate per 10 sec. was in 4 min., 16; in 12 min., 19; and in 2 hours 9 min., 16. — On the following day, it was 14; and on the 6th day, 19.	— *After atropia and physostigma*, none. There was no defæcation, urination, nor salivation during the 2 hours 30 min. of continuous observation.	— *After atropia and physostigma*, in 1 min. 30 sec., slight fibrillary twitches, which soon became very well marked, and continued so for more than 2 hours. In 13 min., slight paralysis; in 35 min., well-marked paralysis; and in 2 hours, almost no paralysis. Occasionally, feeble tremors occurred.
	b 3 lbs.	0	0	0·12	Death, in 46 min.	—	—	—	—	—
254. *a* [Experiment *b* was performed eleven days after experiment *a*.]	3 lbs. 4 oz.	2·7	2·5	0·19	Recovery.	*Before the experiment*, the size was $\frac{19}{50} \times \frac{9}{50}$. *After atropia and physostigma*, the size was in 6 min., $\frac{18}{50} \times \frac{18}{50}$; in 45 min., $\frac{16}{50} \times \frac{16}{50}$; and in 2 hours, $\frac{16}{50} \times \frac{16}{50}$.—On the following day it was $\frac{16}{50} \times \frac{16}{50}$.	*Before the experiment*, the rate was 40 per 10 sec. *After atropia and physostigma*, the rate per 10 sec. was in 4 min., 50; in 8 min., 46; in 24 min., 53; in 44 min., 59; in 1 hour 54 min., 47; and in 2 hours 34 min., 38.—On the following day, it was 28; on the 3d day, 35; and on the 12th day, 41.	*Before the experiment*, the rate was 23 per 10 sec. *After atropia and physostigma*, the rate per 10 sec. was in 6 min., 18; in 22 min., 26; in 44 min., 18; and in 2 hours 35 min., 17.—On the following day it was 21.	— *After atropia and physostigma*, in 43 min., in 1 hour, in 1 hour 21 min., and in 2 hours 34 min., several normal fæcal pellets were passed; and in 54 min., urine was voided. There was no salivation.	— *After atropia and physostigma*, in 2 min., slight fibrillary twitches, which soon became well marked, and continued so for more than 2 hours 30 min. In 20 min., slight paralysis; in 30 min., well-marked paralysis; and in 1 hour 50 min., only slight paralysis.
	b 3 lbs. 6 oz.	0	0	0·17 (= 0·15 gr. p. 3 lbs.)	Death, in 31 min.	—	—	—	—	—

Number of Experiment.	Weight of Rabbit.	Doses of Sulphate of Atropia (in Grains). Actual Dose.	Doses of Sulphate of Atropia (in Grains). Dose p. 3 lbs. of Animal.	Dose of Physostigma (in Grains). Actual Dose of Sul. of Physostigmia.	Result.	Effect on the Pupils. (The Measurements are in fiftieths of an inch.)	Effect on the Heart.	Effect on the Respirations.	Effect on Secretion and Excretion.	Effects on Motility, &c.
255. *a* [Experiment *b* was performed thirteen days after experiment *a*].	3 lbs.	3·	3·	0·18	Recovery.	*Before the experiment*, the size was $\frac{14}{50} \times \frac{13}{50}$. *After atropia and physostigma*, the size was in 2 min., $\frac{16}{50} \times \frac{16}{50}$; and in 5 min., $\frac{17}{50} \times \frac{17}{50}$.—On the following day, it was $\frac{16}{50} \times \frac{16}{50}$; on the 3d day, $\frac{15}{50} \times \frac{15}{50}$; and on the 4th day, $\frac{14}{50} \times \frac{14}{50}$.	*Before the experiment*, the rate was 38 per 10 sec. *After atropia and physostigma*, the rate per 10 sec. was in 2 min., 43; in 18 min., 48; in 50 min., 38; in 1 hour 17 min., 32; and in 1 hour 30 min., 32.—On the following day, it was 35; on the 3d day, 39; and on the 4th day, 40.	*Before the experiment*, the rate was 19 per 10 sec. *After atropia and physostigma*, none. There was no defæcation, urination, nor salivation during the 1 hour and 40 min. of continuous observation.	—	—
	b 3 lbs. 2 oz.	0	0	0·13 (= nearly 0·12 gr. p. 3 lbs.)	Death, in 17 min.	—	—	—	—	—
256. *a* [Experiment *b* was performed ten days after experiment *a*.]	3 lbs.	3·3	3·3	0·18	Recovery.	*Before the experiment*, the size was $\frac{11}{50} \times \frac{13}{50}$. *After atropia and physostigma*, the size was in 2 min., $\frac{15}{50} \times \frac{15}{50}$; in 20 min., $\frac{15}{50} \times \frac{15}{50}$; and in 2 hours, $\frac{15}{50} \times \frac{15}{50}$.—On the following day, it was $\frac{15}{50} \times \frac{15}{50}$; and on the 11th day, $\frac{11}{50} \times \frac{13}{50}$.	*Before the experiment*, the rate was 40 per 10 sec. *After atropia and physostigma*, the rate per 10 sec. was in 1 min. 30 sec., 47; in 4 min., 48; in 7 min., 44; in 17 min., 42; in 1 hour, 44; in 1 hour 40 min., 38; and in 1 hour 50 min., 31.—On the following day, it was 31; and on the 3d day, 41.	*Before the experiment*, the rate was 18 per 10 sec. *After atropia and physostigma*, the rate per 10 sec. was in 11 min., 16; in 30 min., 13; in 50 min., 11; and in 1 hour 40 min., 13.—On the following day, it was 14; and on the 3d day, 17.	—	—
	b 3 lbs. 1 oz.	0	0	0·12	Death, in 28 min.	—	—	—	—	—
257.	3 lbs. 6 oz.	3·93	3·5	0·2	Death, in 1 hour 56 min. after the commencement of the experiment.	*Before the experiment*, the size was $\frac{11}{50} \times \frac{13}{50}$. *With atropia and physostigma*, the size was in 1 min., $\frac{15}{50} \times \frac{15}{50}$; in 3 min., $\frac{15}{50} \times \frac{15}{50}$; in 33 min., $\frac{17}{50} \times \frac{17}{50}$; in 1 hour 20 min., $\frac{18}{50} \times \frac{18}{50}$; and in 1 hour 54 min., $\frac{18}{50} \times \frac{18}{50}$.—After death, it was in 1 min., $\frac{15}{50} \times \frac{16}{50}$; in 4 min., $\frac{15}{50} \times \frac{15}{50}$; in 16 min., $\frac{12}{50} \times \frac{11}{50}$; and in 20 min., $\frac{12}{50} \times \frac{12}{50}$.	*Before the experiment*, the rate was 43 per 10 sec. *After atropia and physostigma*, the rate per 10 sec. was in 2 min., 52; in 4 min., 48; in 6 min., 46; in 15 min., 47; in 20 min., 55; in 35 min., 48; in 58 min., 47; in 1 hour 52 min., 52; and in 1 hour 53 min., 51 (impulse now very weak).	*Before the experiment*, the rate was 18 per 10 sec. *After atropia and physostigma*, the rate per 10 sec. was in 4 min., 22; in 8 min., 26; in 12 min., 17; in 33 min., 20; in 57 min., 17; in 1 hour 6 min., 10; and in 1 hour 53 min., 2. Afterwards, feeble respiratory movements occurred infrequently and irregularly until death.	— *After atropia and physostigma*, in 20 min., urine was freely voided. There was no defæcation nor salivation.	— *After atropia and physostigma*, in 3 min., infrequent fibrillary twitches, which became pretty well marked, but had altogether disappeared about 1 hour before death. In 18 min., distinct paralysis; and in 58 min., general flaccidity. Tremors occurred frequently, and shortly before death there were some spasmodic movements.—Rigor had not commenced at 29 min. after death.

Number of Experiment.	Weight of Rabbit.	Doses of Sulphate of Atropia (in Grains). Actual Dose.	Doses of Sulphate of Atropia (in Grains). Dose p. 3 lbs. of Animal	Dose of Physostigma (in Grains). Actual Dose of Sul. of Physostigmia.	Result.	Effect on the Pupils. (The Measurements are in fiftieths of an inch.)	Effect on the Heart.	Effect on the Respirations.	Effect on Secretion and Excretion.	Effects on Motility, &c.
258.	3 lbs.	4	4	0·18	Death, in 49 min. after the commencement of the experiment.	*Before the experiment*, the size was $\frac{8}{50} \times \frac{7}{50}$. *After atropia and physostigma*, the size was in 4 min., $\frac{14}{50} \times \frac{15}{50}$; in 46 min., $\frac{14}{50} \times \frac{14}{50}$; and in 48 min., $\frac{14}{50} \times \frac{14}{50}$.—After death, it was in 1 min., $\frac{14}{50} \times \frac{14}{50}$; in 4 min., $\frac{13}{50} \times \frac{13}{50}$; and in 42 min., $\frac{12}{50} \times \frac{12}{50}$.	*Before the experiment*, the rate was 36 per 10 sec. *After atropia and physostigma*, the rate per 10 sec. was in 3 min., 49; in 29 min., 61; in 34 min., 59; in 40 min., 34; and in 46 min., 20.	*Before the experiment*, the rate was 33 per 10 sec. *After atropia and physostigma*, the rate per 10 sec. was in 6 min., 29; in 17 min., 17; in 32 min., 10; and in 37 min., 3. Soon afterwards, only feeble gasps occurred irregularly.	— *After atropia and physostigma*, none.	— *After atropia and physostigma*, in 3 min., infrequent fibrillary twitches, which became pretty well marked, and then altogether disappeared shortly before death. In 12 min., distinct paralysis; and in 27 min., general flaccidity. Tremors and feeble spasms occurred frequently.—Rigor commenced to set in at about 42 min. after death (temp. of laboratory, 56° F.).
259.	3 lbs.	4·5	4·5	0·18	Death, in 1 hour 5 min. after the commencement of the experiment.	*Before the experiment*, the size was $\frac{12}{50} \times \frac{11}{50}$. *After atropia and physostigma*, the size was in 3 min., $\frac{15}{50} \times \frac{15}{50}$; in 14 min., $\frac{16}{50} \times \frac{16}{50}$; and in 1 hour, $\frac{16}{50} \times \frac{16}{50}$.—After death, it was in 3 min., $\frac{15}{50} \times \frac{15}{50}$; in 11 min., $\frac{13}{50} \times \frac{13}{50}$; in 44 min., $\frac{12}{50} \times \frac{12}{50}$; and in 1 hour 30 min., $\frac{12}{50} \times \frac{12}{50}$.	*Before the experiment*, the rate was 42 per 10 sec. *After atropia and physostigma*, the rate per 10 sec. was in 3 min., 50; in 15 min., 60; in 30 min., 63; in 58 min., 30; and in 1 hour, 47.	*Before the experiment*, the rate was 26 per 10 sec. *After atropia and physostigma*, the rate per 10 sec. was in 10 min., 40; in 20 min. 38; in 25 min., 22; in 29 min., 15; and in 53 min., 10. Afterwards, irregular gasps only occurred.	— *After atropia and physostigma*, in 18 min., urine was voided. There was no defæcation nor salivation.	— *After atropia and physostigma*, in 2 min., rare fibrillary twitches, which continued until nearly 51 min. In 18 min., very slight paralysis; and in 45 min., general flaccidity. Tremors and spasms occurred frequently.—Rigor commenced to set in at about 1 hour 15 min. after death (temperature of laboratory, 58° F.).
260.	3 lbs. 2 oz.	5·2	5	0·187	Death, in 1 hour 35 min. after the commencement of the experiment.	*Before the experiment*, the size was $\frac{12}{50} \times \frac{11}{50}$. *After atropia and physostigma*, the size was in 3 min., $\frac{15}{50} \times \frac{15}{50}$; in 5 min., $\frac{16}{50} \times \frac{16}{50}$; in 57 min., $\frac{17}{50} \times \frac{17}{50}$; and in 1 hour 34 min., $\frac{17}{50} \times \frac{17}{50}$.—After death, it was 2 min., $\frac{17}{50} \times \frac{17}{50}$; in 5 min., $\frac{16}{50} \times \frac{16}{50}$; in 8 min., $\frac{15}{50} \times \frac{15}{50}$; and in 16 min., $\frac{8}{50} \times \frac{8}{50}$.	*Before the experiment*, the rate was 39 per 10 sec. *After atropia and physostigma*, the rate per 10 sec. was in 2 min. 30 sec., 49; in 8 min., 55; in 57 min., 52; in 1 hour 3 min., 48; in 1 hour 30 min., 36; and in 1 hour 32 min., 34.	*Before the experiment*, the rate was 15 per 10 sec. *After atropia and physostigma*, the rate per 10 sec. was in 3 min., 13; in 30 min., 12; in 57 min., 9; and in 1 hour 17 min., 7. In 1 hour 30 min., the respirations became gasping and extremely infrequent and irregular; and they continued so until death.	— *After atropia and physostigma*, in 5 min., urine was voided. There was no defæcation nor salivation.	— *After atropia and physostigma*, in 1 min. 30 sec., rare fibrillary twitches, which altogether ceased at 55 min. In 30 min., distinct paralysis; and in 1 hour 27 min., general flaccidity. Occasionally there was some feeble tremors, and slight spasmodic movements.

TABLE 2.—EXPERIMENTS IN WHICH ATROPIA WAS ADMINISTERED AFTER PHYSOSTIGMA.

Number of Experiment.	Weight of Rabbit.	Dose of Physostigma (in Grains). Actual Dose of Sul. of Physostigmia.	Doses of Sulphate of Atropia (in Grains). Actual Dose.	Doses of Sulphate of Atropia (in Grains). Dose p. 3 lbs. of Animal.	Interval of Time (in minutes).	Result.	Effect on the Pupils. (The Measurements are in fiftieths of an inch.)	Effect on the Heart.	Effect on the Respiration.	Effect on Secretion and Excretion.	Effects on Motility, &c.
261.	3 lbs. 6 oz.	0·2	0·05	0·05	10	Death, in 46 min. after the administration of physostigma.	*With physostigma*, in 4 min., dilatation from $\frac{1.5}{5.0} \times \frac{1.5}{5.0}$ to $\frac{1.4}{5.0} \times \frac{1.4}{5.0}$; and then in 8 min., contraction to $\frac{1.3}{5.0} \times \frac{1.3}{5.0}$.	*With physostigma*, in 8 min. 30 sec., slowing from 42 to 26 per 10 sec.	*With physostigma*, in 6 min., acceleration from 26 to 30 per 10 sec.	*With physostigma*, in 7 min., the secretion of certain buccal glands was increased.	*With physostigma*, in 1 min. 30 sec., rare fibrillary twitches, which in 7 min. were general and nearly pretty well marked. In 9 min., extension of the limbs and stumbling movements.
							After atropia, the size was in 1 min., $\frac{1.1}{5.0} \times \frac{1.0}{5.0}$; in 5 min., $\frac{8}{5.0} \times \frac{7}{5.0}$; in 20 min., $\frac{7}{5.0} \times \frac{6}{5.0}$; in 35 min., $\frac{7}{5.0} \times \frac{6}{5.0}$; and in 36 min., $\frac{1.0}{5.0} \times \frac{1.0}{5.0}$.—After death, it was in 1 min., $\frac{1.0}{5.0} \times \frac{1.0}{5.0}$; in 8 min., $\frac{6}{5.0} \times \frac{6}{5.0}$; and in 30 min., $\frac{1.0}{5.0} \times \frac{1.0}{5.0}$.	*After atropia*, the rate per 10 sec. was in 10 min., 28; in 20 min., 24; in 24 min., 30; in 29 min., 36; and in 32 min., 12.	*After atropia*, the rate per 10 sec. was in 8 min., 28; in 16 min., 14 (laboured and noisy); in 22 min., 10; in 28 min., 15 (less impeded); and in 31 min., 9.	*After atropia*, the increased secretion of certain buccal glands became greater, and caused much impediment to respiration. In 32 min., a few fæcal pellets were passed, and a little urine was voided.	*After atropia*, the fibrillary twitches soon became well marked, and continued until after death. In 2 min., distinct paralysis; and in 20 min., general flaccidity. Occasionally, tremors and spasms occurred.
262. *a* [Experiment *b* was performed eight days after experiment *a*.]	2 lbs. 15 oz.	0·17	0·29	0·3	10	Recovery.	*With physostigma*, in 7 min., dilatation from $\frac{1.4}{5.0} \times \frac{1.3}{5.0}$ to $\frac{1.6}{5.0} \times \frac{1.6}{5.0}$.	*With physostigma*, in 6 min., slowing from 45 to 29 per 10 sec.	*With physostigma*, none noted. The original rate was 19 per 10 sec.	*With physostigma*, in 9 min., salivation.	*With physostigma*, in 1 min. 30 sec., fibrillary twitches, which in 9 min. were general and pretty well marked. In 7 min., extension of the limbs.
							After atropia, the size was in 2 min., $\frac{1.7}{5.0} \times \frac{1.7}{5.0}$; in 6 min., $\frac{1.6}{5.0} \times \frac{1.5}{5.0}$; in 25 min., $\frac{1.6}{5.0} \times \frac{1.6}{5.0}$; in 41 min., $\frac{1.7}{5.0} \times \frac{1.7}{5.0}$; in 1 hour 34 min., $\frac{1.8}{5.0} \times \frac{1.8}{5.0}$; and in 3 hours 15 min., $\frac{1.8}{5.0} \times \frac{1.8}{5.0}$.—On the following day, it was $\frac{1.8}{5.0} \times \frac{1.8}{5.0}$; and on the 3d day, $\frac{1.6}{5.0} \times \frac{1.6}{5.0}$.	*After atropia*, the rate could not be ascertained on account of the fibrillary twitches until 17 min., when it was 48 per 10 sec. In 1 hour 34 min., it was 54; and in 2 hours 29 min., 52.—On the following day, it was 32.	*After atropia*, the rate per 10 sec. was in 6 min., 35; in 25 min., 23; in 1 hour, 19; in 2 hours 30 min., 13; and in 3 hours 5 min., 13.—On the following day, it was 27.	*After atropia*, the salivation ceased in less than 5 min. There was no defecation nor urination during the 3 hours 15 min. of continuous observation.	*After atropia*, the fibrillary twitches soon became very well marked, but in 24 min. they were only slight, and remained so until 1 hour 10 min., when they became better marked, and continued so for more than 2 hours. In 4 min., decided paralysis; in 25 min., very decided paralysis; and in 2 hours 20 min., only slight paralysis. Tremors occurred frequently, and occasionally there were some spasmodic movements.
	b 3 lbs.	0·12	0	0	—	Death, in 26 min.	—	—	—	—	—

Number of Experiment.	Weight of Rabbit.	Dose of Physostigma (in Grains). Actual Dose of Sul. of Physostigmia.	Doses of Sulphate of Atropia (in Grains). Actual Dose.	Doses of Sulphate of Atropia (in Grains). Dose p. 3 lbs. of Animal.	Interval of Time (in minutes).	Result.	Effect on the Pupils. (The Measurements are in fiftieths of an inch.)	Effect on the Heart.	Effect on the Respirations.	Effect on Secretion and Excretion.	Effects on Motility, &c.
263. *a* [Experiment *b* was performed six days after experiment *a*.]	3 lbs.	0·18	0·5	0·5	10	Recovery.	*With physostigma*, none. The original size was $\frac{15}{50} \times \frac{15}{50}$. *After atropia*, the size was in 2 min., $\frac{17}{50} \times \frac{17}{50}$; in 4 min., $\frac{13}{50} \times \frac{13}{50}$; and in 3 hours, $\frac{18}{50} \times \frac{18}{50}$.—On the following day, it was $\frac{18}{50} \times \frac{18}{50}$; and on the 7th day, $\frac{18}{50} \times \frac{18}{50}$.	*With physostigma*, in 9 min., slowing from 31 to 27 per 10 sec. *After atropia*, the rate per 10 sec. was in 11 min., 57; in 17 min., 61; in 47 min., 63; in 1 hour 15 min., 54; and in 3 hours, 51.—On the following day, it was 27; on the 3d day, 24; and on the 7th day, 34.	*With physostigma*, in 4 min., acceleration from 24 to 27 per 10 sec. *After atropia*, the rate per 10 sec. was in 11 min., 39; in 50 min., 41; in 1 hour 40 min., 28; and in 3 hours, 22.—On the following day, it was 19.	*With physostigma*, in 4 min., increase in the secretion of certain buccal glands. *After atropia*, the above increase ceased in 1 or 2 min. There was no defæcation, urination, nor salivation during the 3 hours 20 min. of continuous observation.	*With physostigma*, in 8 min., pretty general fibrillary twitches. In 9 min. 30 sec., slight paralysis. *After atropia*, the fibrillary twitches soon became well marked, and remained nearly so for more than 3 hours. The paralysis did not distinctly increase until 40 min., when it was pretty well marked; and in 2 hours 40 min., it had almost disappeared. Occasionally, tremors and starts occurred; and the latter could be caused by slight excitations.
	b	3 lbs.	0·12	0	0	—	Death, in 19 min.	—	—	—	—	—
264. *a* [Experiment *b* was performed seven days after experiment *a*.]	3 lbs. 8 oz.	0·21	1·1	1	10	Recovery.	*With physostigma*, in 9 min., dilatation from $\frac{13}{50} \times \frac{13}{50}$ to $\frac{14}{50} \times \frac{14}{50}$. *After atropia*, the size was in 6 min., $\frac{18}{50} \times \frac{18}{50}$; in 20 min., $\frac{17}{50} \times \frac{17}{50}$; and in 2 hours 50 min., $\frac{15}{50} \times \frac{15}{50}$.—On the following day, it was $\frac{14}{50} \times \frac{14}{50}$; and on the 6th day, $\frac{14}{50} \times \frac{13}{50}$.	*With physostigma*, in 9 min. 30 sec., slowing from 46 to 33 per 10 sec. *After atropia*, the rate could not be ascertained on account of the very well-marked fibrillary twitches.—On the following day, it was 39 per 10 sec.; and on the 6th day, 42.	*With physostigma*, none. The original rate was 29 per 10 sec. *After atropia*, the rate per 10 sec. was in 6 min., 33; in 20 min., 37; in 1 hour, 35; and in 2 hours 50 min., 28.—On the following day, it was 39.	*With physostigma*, in 8 min., slight salivation. *After atropia*, the salivation had ceased in 4 min. In 45 min., fæcal pellets were passed, and this was repeated frequently, the fæces being at 2 hours 20 min. of a semi-liquid consistence. In 1 hour, and in 2 hours 40 min., urine was voided.	*With physostigma*, in 9 min. 30 sec., well-marked and general fibrillary twitches. In 6 min., extension of limbs; and in 9 min., slight paralysis, with stumbling movements. *After atropia*, the fibrillary twitches very soon became very well marked, and continued so for more than 2 hours 50 min. In 5 min., distinct paralysis; in 1 hour 40 min., well-marked paralysis; and in 2 hours 20 min., distinct, though diminished, paralysis.
	b	3 lbs. 6 oz.	0·135	0	0	—	Death, in 39 min.	—	—	—	—	—
265. *a* [Experiment *b* was performed seven days after experiment *a*.]	3 lbs.	0·18	1·5	1·5	10	Recovery.	*With physostigma*, none. The original size was $\frac{13}{50} \times \frac{13}{50}$. *After atropia*, the size was in 3 min., $\frac{16}{50} \times \frac{16}{50}$; in 11 min., $\frac{17}{50} \times \frac{17}{50}$; and in 2 hours 12 min., $\frac{17}{50} \times \frac{17}{50}$.	*With physostigma*, in 6 min., slowing from 51 to 34 per 10 sec. *After atropia*, the rate per 10 sec. was in 30 min., 57; in 1 hour 6 min., 50; and in 2 hours 15 min., 47.—On the following day, it was 45; on the 3d day, 47; and on the 8th day, 41.	*With physostigma*, none noted. The original rate was 47 per 10 sec. *After atropia*, the rate per 10 sec. was in 12 min., 49; in 40 min., 38; in 50 min., 28; and in 2 hours 14 min., 47.—On the following day, it was 23.	*With physostigma*, in 6 min., slight increase of the secretion of certain buccal glands; and in 8 min. 30 sec., passage of normal fæcal pellets. *After atropia*, the above increased in a very few min. In 14 min., several normal fæcal pellets were passed.—There was no urination during the 2 hours 15 min. of continuous observation.	*With physostigma*, in 7 min., pretty well-marked and general fibrillary twitches. In 9 min., some exension of the limbs, and stumbling movements. *After atropia*, the fibrillary twitches soon became very well marked, but they lessened greatly after 30 min. In 6 min., distinct paralysis; in 50 min., well-marked paralysis; and in 2 hours, distinct, though diminished, paralysis. Tremors and spasmodic movements occurred frequently.
	b	3 lbs.	0·18	0	0	—	Death, in 29 min.	—	—	—	—	—

Number of Experiment.	Weight of Rabbit.	Dose of Physostigma (in Grains). Actual Dose of Sul. of Physostigmia.	Doses of Sulphate of Atropia (in Grains). Actual Dose.	Doses of Sulphate of Atropia (in Grains). Dose p. 3 lbs. of Animal	Interval of Time (in minutes.)	Result.	Effect on the Pupils. (The Measurements are in fiftieths of an inch.)	Effect on the Heart.	Effect on the Respirations.	Effect on Secretion and Excretion.	Effects on Motility, &c.
266. *a* [Experiment *b* was performed nine days after experiment *a*.]	3 lbs. 1 oz.	0·183	2·	2·	10	Recovery.	*With physostigma*, in 8 min., dilatation from $\frac{10}{50} \times \frac{9}{50}$ to $\frac{12}{50} \times \frac{12}{50}$; and in 9 min. 30 sec., contraction to $\frac{9}{50} \times \frac{9}{50}$. *After atropia*, the size was in 6 min., $\frac{17}{50} \times \frac{17}{50}$; in 14 min., $\frac{15}{50} \times \frac{15}{50}$; and in 3 hours, $\frac{15}{50} \times \frac{15}{50}$.—On the following day, it was $\frac{17}{50} \times \frac{17}{50}$; on the 3d day, $\frac{17}{50} \times \frac{17}{50}$; on the 4th day, $\frac{13}{50} \times \frac{13}{50}$; and on the 7th day, $\frac{11}{50} \times \frac{10}{50}$.	*With physostigma*, in 9 min., slowing from 46 to 33 per 10 sec. *After atropia*, the rate per 10 sec. was in 5 min., 57; in 15 min., 65; in 1 hour, 62; and in 3 hours, 59.—On the following day, it was 45; and on the 10th day, 42.	*With physostigma*, none noted. The original rate was 25 per 10 sec. *After atropia*, moist sounds were present for 2 min., and then ceased. The rate per 10 sec. was in 5 min., 27; in 24 min., 18; in 1 hour, 11; in 1 hour 20 min., 16; and in 3 hours 5 min., 17.—On the following day, it was 20.	*With physostigma*, in 9 min. 20 sec., slight salivation and noisy respiration. In 6 min., several pultaceous pellets were passed. *After atropia*, the salivation ceased in 3 or 4 min. In 2 hours 19 min., several small and dry fæcal pellets. There was no urination during the 3 hours 10 min. of continuous observation.	*With physostigma*, in 9 min., pretty well-marked and general fibrillary twitches. In 7 min., extension of the limbs; and in 9 min., slight paralysis. *After atropia*, the fibrillary twitches soon became well marked, they afterwards gradually lessened until in 20 min., they were extremely rare; and in 2 hours, they had altogether ceased. In 5 min., distinct paralysis; in 20 min., very decided paralysis; and in 3 hours, only slight paralysis. Occasionally, somewhat spasmodic movements occurred.
b	3 lbs. 2 oz.	0·18 (= nearly 0·18 gr. p. 3 lbs.)	0	0	—	Death, in 18 min.	—	—	—	—	—
267. *a* [Experiment *b* was performed eleven days after experiment *a*.]	2 lbs. 15 oz.	0·176	2·25	2·3	10	Recovery.	*With physostigma*, in 7 min., dilatation from $\frac{13}{50} \times \frac{11}{50}$ to $\frac{15}{50} \times \frac{14}{50}$. *After atropia*, the size was in 4 min., $\frac{18}{50} \times \frac{16}{50}$; in 8 min., $\frac{13}{50} \times \frac{13}{50}$; in 30 min., $\frac{16}{50} \times \frac{16}{50}$; and in 2 hours 58 min., $\frac{15}{50} \times \frac{15}{50}$.—On the following day, it was $\frac{14}{50} \times \frac{14}{50}$; and on the 12th day, $\frac{11}{50} \times \frac{10}{50}$.	*With physostigma*, in 8 min., slowing from 40 to 29 per 10 sec. *After atropia*, the rate per 10 sec. was in 2 min., 57; in 6 min., 61; in 10 min., 52; in 18 min., 40; in 37 min., 29; in 1 hour 52 min., 37; and in 3 hours, 33.—On the following day, it was 27; and on the 5th day, 43.	*With physostigma*, in 6 min., slowing from 16 to 14 per 10 sec; and in 9 min., occasional moist sounds. *After atropia*, the moist sounds had ceased within 2 min. The rate per 10 sec. was in 7 min., 17; in 11 min., 16; in 2 hours, 14; and in 3 hours, 16.—On the following day, it was 11; on the 6th day, 13; and on the 12th day, 19.	*With physostigma*, in 9 min., slight salivation; and in 8 min., several normal fæcal pellets. *After atropia*, the salivation ceased nearly immediately. In 2 hours 10 min., several normal fæcal pellets were passed. There was no urination during the 3 hours 20 min. of continuous observation.	*With physostigma*, in 9 min., pretty well-marked and general fibrillary twitches. In 5 min., extension of the limbs; and in 8 min., slight paralysis. *After atropia*, the fibrillary twitches became first well marked, then only slightly marked, and again, after 2 hours, well marked. In 10 min., decided paralysis; in 30 min., an almost flaccid condition; and in 3 hours, slight, though distinct, paralysis. Occasionally, feeble tremors and starts occurred.
b	3 lbs. 3 oz.	0·19 (= 0·18 gr. p. 3 lbs.)	0	0	—	Death, in 16 min. 30 sec.	—	—	—	—	—

Number of Experiment.	Weight of Rabbit	Dose of Physostigma (in Grains). Actual Dose of Sul. of Physostigmia.	Doses of Sulphate of Atropia (in Grains). Actual Dose.	Doses of Sulphate of Atropia (in Grains). Dose p. 3 lbs. of Animal	Interval of Time (in minutes).	Result.	Effect on the Pupils. (The Measurements are in fiftieths of an inch.)	Effect on the Heart.	Effect on the Respirations.	Effect on Secretion and Excretion.	Effects on Motility, &c.
268. *a*	3 lbs. 2 oz. [Experiment *b* was performed twelve days after experiment *a*.]	0·19	2·5	2·4	10	Recovery.	*With physostigma*, in 9 min., dilatation from $\frac{5}{50} \times \frac{7}{50}$ to $\frac{9}{50} \times \frac{8}{50}$. *After atropia*, the size was in 2 min., $\frac{13}{50} \times \frac{14}{50}$; and in 2 hours 20 min., $\frac{14}{50} \times \frac{14}{50}$.—On the following day, it was $\frac{12}{50} \times \frac{9}{50}$; on the 4th day, $\frac{7}{50} \times \frac{6}{50}$; and on the 13th day, $\frac{8}{50} \times \frac{7}{50}$.	*With physostigma*, in 8 min., slowing from 37 to 30 per 10 sec. *After atropia*, the rate per 10 sec. was in 11 min., 57; in 50 min., 52; in 1 hour 25 min., 60; and in 2 hours 30 min., 47.—On the following day, it was 39; on the 4th day, 43; and on the 13th day, 43.	*With physostigma*, in 8 min. 30 sec., slowing from 25 to 29 per 10 sec. *After atropia*, the rate per 10 sec. was in 9 min., 21; in 18 min., 19; in 50 min., 11; in 1 hour 25 min., 18; and in 2 hours 28 min., 21.—On the following day, it was 28.	*With physostigma*, in 5 min., slight increase in the secretion of certain buccal glands. *After atropia*, the above increase soon ceased. There was no defæcation, urination, nor salivation during the 2 hours 40 min. of continuous observation.	*With physostigma*, in 9 min., pretty well-marked and general fibrillary twitches. *After atropia*, the fibrillary twitches were very well marked during the first 10 min.; they then became pretty well-marked, and continued so for more than 2 hours 30 min. In 6 min., distinct paralysis; in 30 min., very decided paralysis; and in 2 hours 30 min., only slight paralysis. Occasionally, tremors occurred, and they could be caused by slight excitation.
b	3 lbs. 6 oz.	0·135 (= 0·12 gr. p. 3 lbs.)	0	0	—	Death, in 31 min.	—	—	—	—	—
269. *a*	3 lbs. 5 oz. [Experiment *b* was performed eight days after experiment *a*.]	0·198	2·76	2·5	10	Recovery.	*With physostigma*, in 9 min., contraction from $\frac{14}{50} \times \frac{18}{50}$ to $\frac{7}{50} \times \frac{6}{50}$. *After atropia*, the size was in 1 min., $\frac{6}{50} \times \frac{6}{50}$; in 4 min., $\frac{13}{50} \times \frac{13}{50}$; in 10 min., $\frac{16}{50} \times \frac{16}{50}$; in 18 min., $\frac{17}{50} \times \frac{17}{50}$; and in 1 hour 15 min., $\frac{16}{50} \times \frac{16}{50}$.—On the following day, it was $\frac{16}{50} \times \frac{16}{50}$; on the 6th day, $\frac{14}{50} \times \frac{14}{50}$; and on the 9th day, $\frac{14}{50} \times \frac{14}{50}$.	*With physostigma*, in 4 min. 30 sec., slowing from 38 to 31 per 10 sec. *After atropia*, the rate per 10 sec. was in 3 min., 58; in 9 min., 60; in 18 min., 64; in 54 min., 49; and in 1 hour 20 min., 43.—On the following day, it was 29; on the 3d day, 24; on the 6th day, 39; and on the 9th day, 40.	*With physostigma*, no change in the rate was noted. The original rate was 23 per 10 sec. In 9 min., moist sounds accompanied the respirations. *After atropia*, the moist sounds had ceased in 4 min. The rate per 10 sec. was in 4 min., 22; in 17 min., 20; in 25 min., 34; in 32 min., 24; and in 1 hour 16 min., 21.—On the following day, it was 16; and on the 3d day, 24.	*With physostigma*, in 8 min. 50 sec., salivation; and in 9 min., several fæcal pellets were passed. *After atropia*, the salivation ceased almost immediately, but it re-appeared in 9 min., and continued until 30 min. No defæcation nor urination occurred during the 1 hour 25 min. of continuous observation.	*With physostigma*, in 9 min., pretty well-marked and general fibrillary twitches. In 6 min., extension of the limbs; and in 9 min. 30 sec., slight paralysis and stumbling movements. *After atropia*, in 6 min., the fibrillary twitches were well marked, but in 15 min. they had almost ceased. In 2 min., decided paralysis; and in 32 min., very decided paralysis, which had not appreciably lessened at 1 hour 25 min. Tremors and starts occurred frequently.
b	3 lbs. 5 oz.	0·19 (= nearly 0.18 gr. p. 3 lbs.)	0	0	—	Death, in 15 min.	—	—	—	—	—

Number of Experiment.	Weight of Rabbit.	Dose of Physostigma (in Grains). Actual Dose of Sul. of Physostigmia.	Doses of Sulphate of Atropia (in Grains). Actual Dose.	Doses of Sulphate of Atropia (in Grains). Dose p. 3 lbs. of Animal.	Interval of Time (in minutes).	Result.	Effect on the Pupils. (The Measurements are in fiftieths of an inch.)	Effect on the Heart.	Effect on the Respirations.	Effect on Secretion and Excretion	Effects on Motility, &c.
270.	2 lbs. 12 oz.	0·165	2·49	2·7	10	Death, in 42 min. after the administration of physostigma.	*With physostigma*, in 6 min., dilatation from $\frac{14}{50} \times \frac{13}{50}$ to $\frac{15}{50} \times \frac{14}{50}$.	*With physostigma*, in 9 min., slowing from 41 to 28 per 10 sec.	*With physostigma*, in 5 min., slowing from 14 to 11 per 10 sec.	*With physostigma*, in 4 min, slight increase of the secretion of certain buccal glands.	*With physostigma*, in 9 min. 30 sec., pretty well-marked and general fibrillary twitches. In 6 min. 30 sec., extension of limbs; and in 9 min., stumbling movements.
							After atropia, the size was in 3 min., $\frac{19}{50} \times \frac{18}{50}$; in 9 min., $\frac{17}{50} \times \frac{16}{50}$; and in 31 min. 30 sec., $\frac{15}{50} \times \frac{13}{50}$.—After death, it was in 1 min., $\frac{16}{50} \times \frac{15}{50}$; in 2 min., $\frac{14}{50} \times \frac{14}{50}$; in 5 min., $\frac{19}{50} \times \frac{19}{50}$; in 11 min., $\frac{9}{50} \times \frac{8}{50}$; in 50 min., $\frac{19}{50} \times \frac{19}{50}$; and in 1 hour 20 min., $\frac{19}{50} \times \frac{19}{50}$.	*After atropia*, the rate per 10 sec. was in 2 min., 57; in 11 min., 58; in 21 min., 55; in 26 min., 47; and in 30 min., 34.	*After atropia*, the rate per 10 sec. was in 3 min., 18; in 9 min., 22; in 12 min., 19; in 21 min., 6; in 26 min., 3; and in 28 min., 2. Afterwards, only rare gasps occurred irregularly until death.	*After atropia*, the above increase soon ceased. There was no defæcation, urination, nor salivation.	*After atropia*, the fibrillary twitches became well marked, but were only slight at 11 min., and soon after they ceased. In 3 min., distinct paralysis; and in 20 min., general flaccidity. Frequently, tremors and feeble spasms occurred.—The first appearance of rigor was at 1 hour 20 min. after death (temp. of laboratory, 62° F.).
271.	2 lbs. 15 oz.	0·176	2·93	3	10	Death, in 35 min. after the administration of physostigma.	*With physostigma*, in 9 min., dilatation from $\frac{13}{50} \times \frac{11}{50}$ to $\frac{13}{50} \times \frac{13}{50}$.	*With physostigma*, in 6 min., slowing from 42 to 31 per 10 sec.	*With physostigma*, in 5 min., acceleration from 23 to 26 per 10 sec.	*With physostigma*, in 9 min., slight salivation.	*With physostigma*, in 9 min. 30 sec., nearly well-marked fibrillary twitches. In 7 min., extension of limbs; and in 9 min., slight paralysis.
							After atropia, the size was in 2 min., $\frac{17}{50} \times \frac{17}{50}$; in 12 min., $\frac{16}{50} \times \frac{16}{50}$; and in 25 min., $\frac{15}{50} \times \frac{15}{50}$.—After death, it was in 2 min., $\frac{13}{50} \times \frac{13}{50}$; in 5 min., $\frac{11}{50} \times \frac{10}{50}$; and in 50 min., $\frac{13}{50} \times \frac{11}{50}$.	*After atropia*, the rate per 10 sec. was in 5 min., 45; in 7 min., 58; in 10 min., 63; in 19 min., 45; in 22 min., 38; and in 23 min. 30 sec., 26.	*After atropia*, the rate per 10 sec. was in 3 min., 33; in 10 min., 24; in 17 min., 16; and in 20 min., 8. Afterwards, infrequent gasps occurred irregularly.	*After atropia*, the salivation ceased almost immediately. In 15 min., urine was freely voided. There was no defæcation.	*After atropia*, the fibrillary twitches were well marked for a few minutes; they then became slight, and afterwards ceased altogether. In 5 min., decided paralysis; and in 20 min., general flaccidity. Some excited movements took place, and, latterly, there were several feeble convulsions.—The first appearance of rigor was at 50 min. after death (temp. of laboratory, 62° F.).

Number of Experiment.	Weight of Rabbit.	Dose of Physostigma (in Grains). Actual Dose of Sul. of Physostigmia.	Doses of Sulphate of Atropia (in Grains). Actual Dose.	Doses of Sulphate of Atropia (in Grains). Dose p. 3 lbs. of Animal.	Interval of Time in (minutes).	Result.	Effect on the Pupils. (The Measurements are in fiftieths of an inch.)	Effect on the Heart.	Effect on the Respirations.	Effect on Secretion and Excretion.	Effects on Motility, &c.
272. *a*	3 lbs. 7 oz. [Experiment *b* was performed six days after experiment *a*.]	0·206	0·34	0·3	14	Recovery.	*With physostigma*, in 10 min., dilatation from $\frac{14}{50} \times \frac{13}{50}$ to $\frac{16}{50} \times \frac{16}{50}$; and in 13 min. 30 sec., contraction to $\frac{6}{50} \times \frac{6}{50}$.	*With physostigma*, in 13 min. 40 sec., slowing from 40 to 14 per 10 sec.	*With physostigma*, in 13 min., laboured, noisy, and gasping respirations occurred very infrequently and irregularly. The original rate was 23 per 10 sec.	*With physostigma*, in 11 min., saliva was freely escaping, and there was considerable accumulation of fluid in the fauces and air passages. In 13 min., several fæcal pellets were passed.	*With physostigm*, in 11 min., well-marked and general fibrillary twitches. In 5 min. 30 sec., extension of the limbs; in 11 min., distinct paralysis; and in 13 min. 30 sec., very advanced paralysis, the rabbit being flaccid on the side.
							After atropia, the size was in 5 min., $\frac{9}{50} \times \frac{8}{50}$; in 7 min., $\frac{14}{50} \times \frac{14}{50}$; in 10 min., $\frac{16}{50} \times \frac{16}{50}$; in 26 min., $\frac{15}{50} \times \frac{15}{50}$; in 35 min., $\frac{14}{50} \times \frac{13}{50}$; in 1 hour 21 min., $\frac{13}{50} \times \frac{13}{50}$; and in 3 hours 5 min., $\frac{11}{50} \times \frac{11}{50}$.—On the following day, it was $\frac{14}{50} \times \frac{13}{50}$; and on the 7th day, $\frac{14}{50} \times \frac{13}{50}$.	*After atropia*, the rate per 10 sec. was in 4 min., 54; in 8 min., 62; in 1 hour 8 min., 61; in 2 hours 20 min., 50; and in 3 hours 6 min., 33.—On the following day, it was 31; on the 3d day, 42; and on the 7th day, 42.	*After atropia*, the laboured infrequent gasps continued for about 2 min.; but in 4 min., normal respiratory movements occurred 17 times per 10 sec. The rate per 10 sec. was in 14 min., 17; in 26 min., 18; in 1 hour 8 min., 21; and in 3 hours 4 min., 24. The moist sounds did not cease until 3 hours 4 min.	*After atropia*, in 15 min., the salivation ceased, but reappeared in 1 hour 45 min., and again disappeared in 3 hours; several pultaceous fæcal pellets were passed; and in 3 hours 5 min., a little urine was voided.	*After atropia*, the fibrillary twitches were very well marked until 2 hours, after which they gradually diminished. In 14 min., the rabbit succeeded in turning from the side, and then the paralysis slowly lessened; and at 2 hours, the rabbit was in a normal sitting posture.
b	3 lbs. 8 oz.	0·21 (= 0·18 gr. p. 3 lbs.)	0	0	—	Death, in 23 min.	—	—	—	—	—
273. *a*	3 lbs. 7 oz. [Experiment *b* was performed six days after experiment *a*.]	0·206	0·34	0·3	15	Recovery.	*With physostigma*, in 7 min., dilatation from $\frac{13}{50} \times \frac{11}{50}$ to $\frac{14}{50} \times \frac{14}{50}$; and in 14 min., contraction to $\frac{8}{50} \times \frac{7}{50}$.	*With physostigma*, in 14 min. 30 sec., slowing from 40 to 21 per 10 sec.	*With physostigma*, in 12 min., slowing from 40 to 34 per 10 sec.; and in 14 min., laboured and noisy respirations.	*With physostigma*, in 14 min., saliva was freely escaping, and there was considerable accumulation of fluid in the fauces and air passages.	*With physostigma*, in 12 min., pretty well-marked and general fibrillary twitches. In 8 min., extension of the limbs; and in 14 min., very decided paralysis.
							After atropia, the size was in 6 min., $\frac{17}{50} \times \frac{15}{50}$; in 1 hour 35 min., $\frac{12}{50} \times \frac{12}{50}$; and in 2 hours 30 min., $\frac{8}{50} \times \frac{8}{50}$.—On the following day, it was $\frac{15}{50} \times \frac{15}{50}$; on the 3d day, $\frac{12}{50} \times \frac{12}{50}$; and on the 6th day, $\frac{13}{50} \times \frac{13}{50}$.	*After atropia*, the rate per 10 sec. was in 5 min. 30 sec., 54; in 20 min., 63; and in 1 hour 36 min., 61.—On the following day, it was 28; on the 3d day, 35; and on the 6th day, 38.	*After atropia*, the rate per 10 sec. was in 4 min., 20; in 38 min., 28; and in 2 hours 32 min., 35. The moist sounds disappeared at about 12 min., but they reappeared at 1 hour 35 min.—On the following day, the rate was 35 per 10 sec.	*After atropia*, in 12 min., the salivation ceased, and it did not recur. There was no defæcation nor urination during the 2 hours 40 min. of continuous observation.	*After atropia*, the fibrillary twitches soon became very well marked, and they continued so for more than 2 hours 35 min. In 12 min., the paralysis had distinctly lessened; but it was still marked at 2 hours 40 min. Neither tremors nor spasms occurred.
b	3 lbs. 9 oz.	0·21 (= 0·18 gr. nearly p. 3 lbs.)	0	0	—	Death, in 17 min.	—	—	—	—	—

Number of Experiment.	Weight of Rabbit.	Dose of Physostigma (in Grains). Actual Dose of Sul. of Physostigmia.	Doses of Sulphate of Atropia (in Grains). Actual Dose.	Doses of Sulphate of Atropia (in Grains). Dose p. 3 lbs. of Animal.	Interval of Time (in minutes).	Result.	Effect on the Pupils. (The Measurements are in fiftieths of an inch.)	Effect on the Heart.	Effect on the Respirations.	Effect on Secretion and Excretion.	Effects on Motility, &c.
274. *a* [Experiment *b* was performed six days after experiment *a*.]	3 lbs. 4 oz.	0·195	0·56	0·5	15	Recovery.	*With physostigma*, in 10 min., dilatation from $\frac{14}{50} \times \frac{14}{50}$ to $\frac{15}{50} \times \frac{15}{50}$; and in 14 min. 30 sec., contraction to $\frac{12}{50} \times \frac{12}{50}$.	*With physostigma*, in 7 min., slowing from 46 to 38 per 10 sec. Afterwards, the rate could not be ascertained on account of the fibrillary twitches, and the tremors and struggles that were excited when the hand was placed on the thorax.	*With physostigma*, in 14 min., laboured, noisy, and impeded respirations occurred infrequently. The original rate was 25 per 10 sec.	*With physostigma*, in 9 min., saliva was freely escaping. In 8 min., several normal fæcal pellets were passed; and in 14 min., wet and pultaceous fæces.	*With physostigma*, in 8 min., well-marked and general fibrillary twitches. In 6 min., extension of the limbs; in 11 min., decided paralysis; and in 14 min. 30 sec., general flaccidity. In 9 min., tremors occurred; and in 14 min., there were some very feeble spasmodic movements.
							After atropia, the size was in 2 min., $\frac{9}{50} \times \frac{9}{50}$; in 4 min., $\frac{14}{50} \times \frac{14}{50}$; in 10 min., $\frac{17}{50} \times \frac{17}{50}$; and in 2 hours 40 min., $\frac{18}{50} \times \frac{18}{50}$.—On the following day, it was $\frac{18}{50} \times \frac{18}{50}$; on the 4th day, $\frac{16}{50} \times \frac{16}{50}$; and on the 7th day, $\frac{16}{50} \times \frac{16}{50}$.	*After atropia*, the rate per 10 sec. was in 38 min., 64; and in 1 hour 20 min., 64.—On the following day, it was 44; and on the 7th day, 44.	*After atropia*, the rate per 10 sec. was in 5 min., 20; in 7 min., 15; in 11 min., 12; in 27 min., 16; in 1 hour 22 min., 22; and in 2 hours 40 min., 16. The moist sounds lessened after 1 hour 40 min., and soon afterwards they ceased.	*After atropia*, in about 38 min., the salivation ceased, and it did not recur. In 2 hours, a large number of normal fæcal pellets were passed. There was no urination during the 2 hours 40 min. of continuous observation.	*After atropia*, in 30 min., the fibrillary twitches were only pretty well marked, and they continued so for more than 2 hours. The paralysis did not appreciably diminish until 1 hour 30 min., but in 2 hours there were only slight paralysis. Neither tremors nor spasms occurred.
	b	3 lbs. 6 oz.	0·13 (= 0.12 gr. p. 3 lbs.)	0	0	—	Death, in 19 min.	—	—	—	—	—
275. *a* [Experiment *b* was performed seven days after experiment *a*.]	3 lbs.	0·18	1	1	15	Recovery.	*With physostigma*, in 6 min. 30 sec., dilatation from $\frac{15}{50} \times \frac{15}{50}$ to $\frac{16}{50} \times \frac{16}{50}$; and in 10 min., contraction to $\frac{5}{50} \times \frac{5}{50}$.	*With physostigma*, in 13 min., slowing from 42 to 18 per 10 sec.	*With physostigma*, in 14 min., slowing from 39 to 16 per 10 sec. In 10 min., the respirations became noisy, and in 14 min., noisy and laboured.	*With physostigma*, in 9 min. 30 sec., saliva was escaping. In 10 min., several fæcal pellets were passed.	*With physostigma*, in 14 min., well-marked and general fibrillary twitches. In 6 min., extension of the limbs; and in 13 min. 20 sec., general flaccidity, with the animal lying on the side.
							After atropia, the size was in 2 min., $\frac{9}{50} \times \frac{9}{50}$; in 5 min., $\frac{7}{50} \times \frac{6}{50}$; in 9 min., $\frac{13}{50} \times \frac{13}{50}$; in 12 min., $\frac{14}{50} \times \frac{14}{50}$; in 25 min., $\frac{10}{50} \times \frac{10}{50}$; and in 1 hour 20 min., $\frac{11}{50} \times \frac{11}{50}$.—On the following day, it was $\frac{10}{50} \times \frac{10}{50}$; on the 6th day, $\frac{15}{50} \times \frac{15}{50}$; and on the 8th day, $\frac{13}{50} \times \frac{13}{50}$.	*After atropia*, the rate per 10 sec. was in 2 min., 46; in 7 min., 58; in 14 min., 62; in 23 min., 42; in 47 min., 42; and in 1 hour 11 min., 42.—On the following day, it was 50; on the 3d day, 42; and on the 8th day, 43.	*After atropia*, the rate per 10 sec. was in 3 min., 9; in 13 min., 8; in 30 min., 7; in 1 hour, 9; and in 1 hour 10 min., 16. The moist sounds ceased in 13 min., but reappeared, though for only 10 min., in 1 hour. The respirations were extremely feeble until 1 hour.—On the 2d day, the rate per 10 sec. was 23.	*After atropia*, the salivation ceased in a few min., but it reappeared in a slight form at 50 min.; and again ceased at 1 hour 10 min. In 45 min., several fæcal pellets were passed. There was no urination during the 1 hour 20 min. of continuous observation.	*After atropia*, the fibrillary twitches were very well marked for 10 min.; they were then extremely slight for about 40 min.; but in 1 hour 10 min., they were again well marked. The condition of general flaccidity did not appreciably improve until 52 min., after which the animal turned from the side; but even at 1 hour 15 min., there was very well marked paralysis. Neither tremors nor spasms occurred during the 1 hour 20 min. of continuous observation.
	b	3 lbs. 2 oz.	0·18 (= nearly 0·18 gr. p. 3 lbs.)	0	0	—	Death, in 18 min.	—	—	—	—	—

Number of Experiment.	Weight of Rabbit.	Dose of Physostigma (in Grains). Actual Dose of Sal. of Physostigmia.	Doses of Sulphate of Atropia (in Grains). Actual Dose.	Doses of Sulphate of Atropia (in Grains). Dose p. 3 lbs. of Animal.	Interval of Time (in minutes).	Result.	Effect on the Pupils. (The Measurements are in fiftieths of an inch.)	Effect on the Heart.	Effect on the Respirations.	Effect on Secretion and Excretion.	Effects on Motility, &c.
276.	3 lbs.	0·18	1·5	1·5	15	Death, in 1 hour 12 min. after the administration of physostigma.	*With physostigma*, in 7 min., dilatation from $\frac{1}{50} \times \frac{1}{50}$ to $\frac{1}{50} \times \frac{1}{50}$; and in 14 min., contraction to $\frac{1}{50} \times \frac{9}{50}$. *After atropia*, the size was in 2 min., $\frac{1}{50} \times \frac{1}{50}$; in 18 min., $\frac{16}{50} \times \frac{16}{50}$; and in 57 min., $\frac{1}{50} \times \frac{1}{50}$.—After death, it was in 2 min., $\frac{14}{50} \times \frac{14}{50}$; in 10 min., $\frac{9}{50} \times \frac{9}{50}$; and in 33 min., $\frac{1}{50} \times \frac{1}{50}$.	*With physostigma*, in 13 min., slowing from 42 to 19 per 10 sec. *After atropia*, the rate per 10 sec. was in 4 min., 49; in 29 min., 60; in 53 min., 41; and in 56 min., 40.	*With physostigma*, in 9 min., slowing from 30 to 26 per 10 sec. In 11 min., the respirations became noisy; and in 14 min., noisy and laboured. *After atropia*, the rate per 10 sec. was in 3 min., 22; in 10 min., 20; in 28 min., 20; and in 50 min., 5. Afterwards only feeble gasps occurred infrequently and irregularly. The moist sounds diminished in 10 min., and they altogether ceased in 25 min.	*With physostigma*, in 13 min., saliva was escaping from the mouth, and several fæcal pellets were passed. *After atropia*, the salivation altogether ceased in 4 min. In 45 min., urine was voided; but there was no defæcation.	*With physostigma*, in 9 min., pretty well marked and general fibrillary twitches. In 6 min., extension of the limbs; and in 14 min., very advanced paralysis. *After atropia*, the fibrillary twitches were well marked for 10 min.; they then diminished; and they finally ceased at 48 min. In 2 min., the paralysis was lessened and remained so for 12 min.; in 45 min., it was again very decided; and in 46 min., the condition was one of general flaccidity. There were no tremors, but some irregular and feeble spasms occurred.—There was no appearance of rigor at 33 min. after death.
277.	3 lbs.	0·18	2	2	15	Death, in 45 min. after the administration of physostigma.	*With physostigma*, in 5 min., dilatation from $\frac{14}{50} \times \frac{13}{50}$ to $\frac{15}{50} \times \frac{14}{50}$; and in 14 min. 30 sec., contraction to $\frac{8}{50} \times \frac{8}{50}$. *After atropia*, the size was in 4 min., $\frac{17}{50} \times \frac{17}{50}$; in 24 min., $\frac{13}{50} \times \frac{13}{50}$; and in 30 min. (moment of death), $\frac{13}{50} \times \frac{13}{50}$.—After death, it was in 3 min., $\frac{13}{50} \times \frac{13}{50}$; in 7 min., $\frac{12}{50} \times \frac{12}{50}$; and in 57 min., $\frac{13}{50} \times \frac{13}{50}$.	*With physostigma*, in 14 min., slowing from 41 to 19 per 10 sec. *After atropia*, the rate per 10 sec. was in 2 min., 52; and in 28 min., 52.	*With physostigma*, in 5 min. 30 sec., acceleration from 22 to 31 per 10 sec. In 14 min., the respirations were noisy, laboured, and infrequent. *After atropia*, in 24 min., the respirations were gasping, and at the rate of only 5 per 10 sec.; and in 29 min. 30 sec., only 2 gasps occurred per 10 sec. The moist sounds altogether ceased in a few minutes.	*With physostigma*, in 7 min., saliva was escaping from the mouth. *After atropia*, the salivation altogether ceased in a few minutes. In 4 min., urine was freely and copiously voided. There was no defæcation.	*With physostigma*, in 13 min., well-marked and general fibrillary twitches. In 7 min., extension of the limbs; and in 14 min., very advanced paralysis. *After atropia*, the fibrillary twitches continued well marked for 11 min.; they afterwards became slight, and remained so for a few min. after death. In 23 min., general flaccidity was present. Occasionally, tremors occurred.—Rigor first began to set in at 57 min. after death (temp. of laboratory, 58° F.).

Number of Experiment.	Weight of Rabbit.	Dose of Physostigma (in Grains). Actual Dose of Sul. of Physostigmia.	Doses of Sulphate of Atropia (in Grains). Actual Dose.	Doses of Sulphate of Atropia (in Grains). Dose p. 3 lbs. of Animal.	Interval of Time (in minutes).	Result.	Effect on the Pupils. (The Measurements are in fiftieths of an inch.)	Effect on the Heart.	Effect on the Respirations.	Effect on Secretion and Excretion.	Effects on Motility, &c.
278.	3 lbs. 8 oz.	0·21	0·32	0·3	17	Death, in 39 min. after the administration of physostigma.	*With physostigma*, in 6 min., dilatation from $\frac{1}{50} \times \frac{1}{50}$ to $\frac{1}{50} \times \frac{1}{50}$; and in 14 min. 30 sec., contraction to $\frac{5}{50} \times \frac{5}{50}$.	*With physostigma*, in 16 min. 30 sec., slowing from 40 to 11 per 10 sec.	*With physostigma*, in 16 min., the respirations were very laboured, impeded by mucus, infrequent, and gasping.	*With physostigma*, in 14 min., saliva was escaping from the mouth.	*With physostigma*, in 12 min., pretty well-marked fibrillary twitches, which were only slight at 16 min. In 6 min., extension of the limbs; in 10 min., decided paralysis; and in 15 min., general flaccidity, the animal lying on the side. Latterly, some tremors occurred.
							After atropia, the size was in 2 min., $\frac{5}{50} \times \frac{5}{50}$; in 3 min., $\frac{6}{50} \times \frac{6}{50}$; in 6 min., $\frac{13}{50} \times \frac{13}{50}$; in 9 min., $\frac{5}{50} \times \frac{5}{50}$; and in 21 min., $\frac{1}{50} \times \frac{1}{50}$.	*After atropia*, the rate per 10 sec. was in 2 min., 44; in 7 min., 59; in 11 min., 37; and in 20 min., 32.	*After atropia*, the respirations soon became normal in character; and their rate was in 5 min., 13; in 6 min., 10; and in 11 min. 30 sec., 4. Afterwards, they consisted of infrequent and irregularly occurring gasps. The moist sounds ceased almost immediately, but they recurred at 9 min.	*After atropia*, there was neither defæcation nor urination.	*After atropia*, the fibrillary twitches remained very slightly marked until death. The state of general flaccidity was not improved. A few struggling irregular movements occurred now and again.
279.	3 lbs.	0·18	0·5	0·5	17	Death, in 40 min. after the administration of physostigma.	*With physostigma*, in 11 min., contraction from $\frac{13}{50} \times \frac{13}{50}$ to $\frac{6}{50} \times \frac{6}{50}$.	*With physostigma*, in 16 min., slowing from 43 to 8 per 10 sec.	*With physostigma*, in 16 min., about 1 feeble gasp per 10 sec. The original rate was 29 per 10 sec.	*With physostigma*, in 10 min., saliva was escaping from the mouth.	*With physostigma*, in 9 min., well-marked and general fibrillary twitches; and in 15 min., only rare and slight twitches. In 6 min., extension of the limbs; in 9 min., decided paralysis; and in 14 min., general flaccidity, the animal lying on the side.
							After atropia, the size was in 3 min., $\frac{5}{50} \times \frac{5}{50}$; in 7 min., $\frac{5}{50} \times \frac{7}{50}$; and in 20 min., $\frac{1}{50} \times \frac{1}{50}$.—After death, it was in 5 min., $\frac{5}{50} \times \frac{7}{50}$.	*After atropia*, the rate per 10 sec. was in 1 min., 25; in 3 min., 54; in 6 min., 59; in 10 min., 60; in 18 min., 30; and in 20 min. 30 sec., 20.	*After atropia*, in 2 min., the respirations were nearly normal, and at the rate of 12 per 10 sec. The rate per 10 sec. was in 5 min., 8; and in 10 min., 5. Afterwards, only infrequent and feeble gasps occurred irregularly until death. The moist sounds were present uninterruptedly until death.	*After atropia*, the salivation was not checked. There was neither defæcation nor urination.	*After atropia*, the fibrillary twitches became again well marked; but after 13 min., they were only slight. The state of general flaccidity was not improved. Occasionally, some feeble tremors occurred.

TABLE 3.—EXPERIMENTS IN WHICH ATROPIA WAS ADMINISTERED BEFORE PHYSOSTIGMA.

Number of Experiment.	Weight of Rabbit.	Doses of Sulphate of Atropia (in Grains). Actual Dose.	Doses of Sulphate of Atropia (in Grains). Dose p. 3 lbs. of Animal.	Dose of Physostigma (in Grains). Actual Dose of Sul. of Physostigmia.	Interval of Time (in minutes).	Result.	Effect on the Pupils. (The Measurements are in fiftieths of an inch.)	Effect on the Heart.	Effect on the Respirations.	Effect on Secretion and Excretion.	Effects on Motility, &c
230.	3 lbs.	0·01	0·01	0·18	5	Death, in 20 min. after the administration of physostigma.	*With atropia*, in 4 min., dilatation from $\frac{13}{50} \times \frac{13}{50}$ to $\frac{14}{50} \times \frac{14}{50}$. *After physostigma*, the size was in 6 min., $\frac{16}{50} \times \frac{16}{50}$; in 8 min., $\frac{18}{50} \times \frac{18}{50}$; in 16 min., $\frac{7}{50} \times \frac{6}{50}$; and in 19 min., $\frac{7}{50} \times \frac{6}{50}$.—After death, it was in 2 min., $\frac{4}{50} \times \frac{3}{50}$; in 26 min., $\frac{2}{50} \times \frac{2}{50}$; and in 1 hour, $\frac{1}{50} \times \frac{1}{50}$.	*With atropia*, in 4 min. 30 sec., acceleration from 45 to 49 per 10 sec. *After physostigma*, the rate per 10 sec. was in 3 min., 50; in 13 min., 30; in 18 min., 20; and in 19 min., 8.	*With atropia*, none. The original rate was 19 per 10 sec. *After physostigma*, the rate per 10 sec. was in 7 min., 18; and in 15 min., 12. After 18 min., only laboured, gasping movements occurred.	*With atropia*, none. *After physostigma*, in 16 min., saliva was freely escaping, and there was considerable accumulation of fluid in the fauces. There was neither defæcation nor urination.	*With atropia*, none. *After physostigma*, in 1 min. 30 sec., slight and infrequent fibrillary twitches, which were pretty well marked in 16 min., and continued for about 14 min. after death. In 6 min., extension of the limbs; in 10 min., decided paralysis; and in 18 min., general flaccidity. Occasionally, feeble tremors occurred.—There was no appearance of rigor at 1 hour 5 min. after death (temp. of laboratory, 58° F.).
281. *a* [Experiment *b* was performed thirteen days after experiment *a*.]	3 lbs.	0·02	0·02	0·18	5	Recovery.	*With atropia*, in 4 min., dilatation from $\frac{14}{50} \times \frac{13}{50}$ to $\frac{15}{50} \times \frac{15}{50}$. *After physostigma*, the size was in 1 min., $\frac{16}{50} \times \frac{16}{50}$; in 6 min., $\frac{17}{50} \times \frac{17}{50}$; and in 1 hour 35 min., $\frac{17}{50} \times \frac{17}{50}$.—On the following day, it was $\frac{15}{50} \times \frac{15}{50}$; and on the 14th day, $\frac{14}{50} \times \frac{13}{50}$.	*With atropia*, in 4 min. 30 sec., acceleration from 40 to 47 per 10 sec. *After physostigma*, the rate per 10 sec. was in 2 min., 50; and in 7 min., 49. It could not afterwards be counted because of the fibrillary twitches.—On the following day, it was 28; and on the 14th day, 42.	*With atropia*, none. The original rate was 16 per 10 sec. *After physostigma*, the rate per 10 sec. was in 3 min., 16; in 36 min., 20; in 50 min., 20; and in 1 hour 36 min., 18. No moist sounds occurred.	*With atropia*, none. *After physostigma*, in 26 min., urine was freely voided. There was neither defæcation nor salivation during the 1 hour 48 min. of continuous observation.	*With atropia*, none. *After physostigma*, in 1 min. 30 sec., slight fibrillary twitches, which gradually increased until, in 14 min., they were very well marked. In 25 min., slight paralysis; in 38 min., very advanced paralysis; and in 1 hour 35 min., only slight paralysis. Frequently, there were tremors and starts.
	3 lbs.	0	0	0·12	—	Death, in 19 min.	—	—	—	—	—
282. *a* [Experiment *b* was performed sixteen days after experiment *a*.]	3 lbs.	0·05	0·05	0·18	5	Recovery.	*With atropia*, in 4 min. 30 sec., dilatation from $\frac{14}{50} \times \frac{13}{50}$ to $\frac{15}{50} \times \frac{14}{50}$. *After physostigma*, the size was in 14 min., $\frac{18}{50} \times \frac{18}{50}$; and in 1 hour 10 min., $\frac{16}{50} \times \frac{16}{50}$.—On the 3d day, it was $\frac{15}{50} \times \frac{14}{50}$; and on the 17th day, $\frac{13}{50} \times \frac{13}{50}$.	*With atropia*, in 4 min., acceleration from 40 to 46 per 10 sec. *After physostigma*, the rate per 10 sec. was in 4 min., 54; in 6 min., 54; in 50 min., 30; and in 1 hour 12 min., 29.—On the 3d day, it was 33; and on the 17th day, 39.	*With atropia*, in 3 min. 30 sec., slowing from 23 to 21 per 10 sec. *After physostigma*, the rate per 10 sec. was in 3 min., 22; in 27 min., 14; and in 1 hour 11 min., 20.—On the 3d day, it was 14; and on the 17th day, 23.	*With atropia*, none. *After physostigma*, in 23 min., salivation commenced, and continued, along with accumulation of fluid in the fauces, for more than 1 hour. In 50 min., and several times afterwards, wet facal pellets were passed. There was no urination during the 1 hour 20 min. of continuous observation.	*With atropia*, none. *After physostigma*, in 14 min., well-marked fibrillary twitches were present, and they continued for more than 1 hour. In 8 min., extension of the limbs; in 14 min., decided paralysis; and in 50 min., very advanced paralysis, which had diminished only a little at 1 hour 20 min. Tremors occurred frequently.
	b 2 lbs. 15 oz.	0	0	0·12 (= nearly 0·12 gr. p. 3 lbs.)	—	Death, in 21 min.	—	—	—	—	—

Number of Experiment.	Weight of Rabbit.	Doses of Sulphate of Atropia (in Grains). Actual Dose.	Doses of Sulphate of Atropia (in Grains). Dose p 3 lbs. of Animal.	Dose of Physostigma (in Grains). Actual Dose of Sul. of Physostigmia.	Interval of Time (in minutes).	Result.	Effect on the Pupils. (The Measurements are in fiftieths of an inch.)	Effect on the Heart.	Effect on the Respirations.	Effect on Secretion and Excretion.	Effects on Motility, &c.
283. *a*	3 lbs. [Experiment *b* was performed fifteen days after experiment *a*.]	3·5	3·5	0·18	5	Recovery.	*With atropia*, in 4 min. 30 sec., dilatation from $\frac{13}{50} \times \frac{13}{50}$ to $\frac{18}{50} \times \frac{18}{50}$. *After physostigma*, the size was in 7 min., $\frac{17}{50} \times \frac{17}{50}$; in 22 min., $\frac{16}{50} \times \frac{16}{50}$; and in 3 hours 30 min., $\frac{16}{50} \times \frac{16}{50}$.—On the following day, it was $\frac{17}{50} \times \frac{17}{50}$; on the 3d day, $\frac{15}{50} \times \frac{15}{50}$; and on the 6th day, $\frac{12}{50} \times \frac{11}{50}$.	*With atropia*, in 4 min., acceleration from 37 to 58 per 10 sec. *After physostigma*, the rate per 10 sec. was in 9 min., 57; in 1 hour, 56; and in 3 hours 28 min., 57.—On the following day, it was 45; on the 3d day, 52; and on the 6th day, 40.	*With atropia*, in 3 min. 30 sec., acceleration from 26 to 32 per 10 sec. *After physostigma*, the rate per 10 sec. was in 8 min., 28; in 32 min., 19; in 1 hour 39 min., 10; in 2 hours, 15; and in 3 hours 30 min., 17.—On the following day, it was 6; and on the 3d day, 20.	*With atropia*, none. *After physostigma*, in 5 min., several normal fæcal pellets were passed. There was neither urination nor salivation during the 3 hours 30 min. of continuous observation.	*With atropia*, none. *After physostigma*, in 4 min., slight fibrillary twitches, which altogether ceased in 20 min. In 20 min., slight paralysis; and in 1 hour, very advanced paralysis, which had diminished but little in 3 hours. There were neither tremors nor spasms.
b	3 lbs. 1 oz.	0	0	0·12	—	Death, in 26 min.	—	—	—	—	—
284. *a*	3 lbs. [Experiment *b* was performed twenty-one days after experiment *a*.]	3·7	3·7	0·18	5	Recovery.	*With atropia*, in 3 min., dilatation from $\frac{14}{50} \times \frac{13}{50}$ to $\frac{17}{50} \times \frac{17}{50}$. *After physostigma*, the size was in 5 min., $\frac{17}{50} \times \frac{17}{50}$; in 1 hour, $\frac{17}{50} \times \frac{17}{50}$; and in 1 hour 40 min., $\frac{17}{50} \times \frac{17}{50}$.—On the following day, it was $\frac{15}{50} \times \frac{17}{50}$; and on the 22d day, $\frac{13}{50} \times \frac{13}{50}$.	*With atropia*, in 4 min., acceleration from 43 to 59 per 10 sec. *After physostigma*, the rate per 10 sec. was in 3 min., 60; in 1 hour, 52; and in 1 hour 45 min., 54.—On the following day, it was 25; and on the 22d day, 43.	*With atropia*, in 3 min., slowing from 21 to 18 per 10 sec. *After physostigma*, none. There was no defæcation, urination, nor salivation during the 1 hour 45 min. of continuous observation.	*With atropia*, none.	*With atropia*, none. *After physostigma*, in 2 min., slight fibrillary twitches, which became pretty well marked, and continued so for more than 1 hour. In 20 min., slight paralysis; and in 40 min., very advanced paralysis, which continued unchanged for more than 1 hour. Frequently, there were feeble tremors.
b	3 lbs. 3 oz.	0	0	0·13 (= 0·12 gr. p. 3 lbs.)	—	Death, in 35 min.	—	—	—	—	—
285.	3 lbs. 12 oz.	4·87	3·9	0·225	5	Death, in 44 min. after the administration of physostigma.	*With atropia*, in 3 min. 30 sec., dilatation from $\frac{15}{50} \times \frac{14}{50}$ to $\frac{17}{50} \times \frac{17}{50}$. *After physostigma*, the size was in 5 min., $\frac{17}{50} \times \frac{17}{50}$; and in 43 min., $\frac{18}{50} \times \frac{18}{50}$.—After death, it was in 6 min., $\frac{15}{50} \times \frac{15}{50}$; and in 16 min., $\frac{11}{50} \times \frac{11}{50}$.	*With atropia*, in 4 min., acceleration from 35 to 60 per 10 sec. *After physostigma*, the rate per 10 sec. was in 4 min., 54; in 10 min., 53; and in 34 min., 59.	*With atropia*, in 3 min., acceleration from 34 to 45 per 10 sec. *After physostigma*, the rate per 10 sec. was in 18 min., 40; in 32 min., 7; in 36 min., 5; and in 38 min., 4. Afterwards, only feeble gasps occurred.	*With atropia*, none. *After physostigma*, none. There was no salivation, defæcation, nor urination.	*With atropia*, none. *After physostigma*, in 3 min., slight fibrillary twitches, which soon became pretty well marked, but had altogether ceased at 32 min. In 15 min., slight paralysis; and in 34 min., general flaccidity. Occasionally, feeble tremors occurred.—There was no appearance of rigor at 16 min. after death (temp. of laboratory, 57° F.).

Number of Experiment.	Weight of Rabbit.	Doses of Sulphate of Atropia (in Grains). Actual Dose.	Doses of Sulphate of Atropia (in Grains). Dose p. 3 lbs. of Animal.	Dose of Physostigma (in Grains). Actual Dose of Sul. of Physostigmia.	Interval of Time (in minutes).	Result.	Effect on the Pupils. (The Measurements are in fiftieths of an inch.)	Effect on the Heart.	Effect on the Respirations.	Effect on Secretion and Excretion.	Effects on Motility, &c.
286.	2 lbs. 8 oz.	4·6	4	0·21	5	Death, in 46 min. after the administration of physostigma.	*With atropia*, in 2 min., dilatation from $\frac{14}{50} \times \frac{13}{50}$ to $\frac{16}{50} \times \frac{15}{50}$. *After physostigma*, the size was in 6 min., $\frac{16}{50} \times \frac{16}{50}$; in 35 min., $\frac{17}{50} \times \frac{17}{50}$; and in 44 min., $\frac{15}{50} \times \frac{17}{50}$.—After death, it was in 2 min., $\frac{13}{50} \times \frac{13}{50}$; in 7 min., $\frac{6}{50} \times \frac{5}{50}$; in 26 min., $\frac{0}{50} \times \frac{0}{50}$; and in 1 hour 25 min., $\frac{11}{50} \times \frac{10}{50}$.	*With atropia*, in 4 min. 30 sec., acceleration from 41 to 58 per 10 sec. *After physostigma*, the rate per 10 sec. was in 3 min., 59; in 15 min., 48; in 40 min., 48; in 42 min., 39; and in 44 min., 26.	*With atropia*, none. The original rate was 24 per 10 sec. *After physostigma*, the rate per 10 sec. was in 4 min., 19; in 25 min., 20; in 32 min., 16; in 35 min., 8; in 40 min., 5; and in 44 min., 2.	*With atropia*, none. *After physostigma*, none. There was no salivation, defæcation, nor urination.	*With atropia*, none. *After physostigma*, in 2 min., slight fibrillary twitches, which had altogether ceased at 25 min. In 25 min., slight paralysis; and in 34 min., general flaccidity. Frequently, feeble tremors occurred.—The first appearance of rigor was at 1 hour 24 min. after death (temp. of laboratory, 58° F.).
287.	3 lbs. 1 oz.	4·38	4·3	0·18	5	Death, in 42 min. after the administration of physostigma.	*With atropia*, in 3 min., dilatation from $\frac{13}{50} \times \frac{13}{50}$ to $\frac{15}{50} \times \frac{15}{50}$. *After physostigma*, the size was in 3 min., $\frac{17}{50} \times \frac{17}{50}$; in 36 min., $\frac{18}{50} \times \frac{18}{50}$; in 41 min., $\frac{18}{50} \times \frac{18}{50}$; and in 41 min. 30 sec., $\frac{13}{50} \times \frac{13}{50}$.—After death, it was in 30 sec., $\frac{15}{50} \times \frac{15}{50}$; in 2 min., $\frac{14}{50} \times \frac{14}{50}$; in 12 min., $\frac{10}{50} \times \frac{10}{50}$; and in 37 min., $\frac{12}{50} \times \frac{12}{50}$.	*With atropia*, in 3 min. 30 sec., acceleration from 40 to 61 per 10 sec. *After physostigma*, the rate per 10 sec. was in 3 min., 60; in 5 min., 50; in 8 min., 48; in 12 min., 54; in 20 min., 60; in 35 min., 58; in 36 min., 50; and in 41 min., 51.	*With atropia*, none. The original rate was 22 per 10 sec. *After physostigma*, the rate per 10 sec. was in 4 min., 26; in 15 min., 23; in 26 min., 19; and in 34 min., 12. Afterwards, only feeble gasps occurred very irregularly.	*With atropia*, none. *After physostigma*, none. There was no salivation, defæcation, nor urination.	*With atropia*, none. *After physostigma*, in 1 min. 30 sec., slight fibrillary twitches, which soon became pretty well marked, but ceased shortly before death. In 15 min., slight paralysis; and in 35 min., general flaccidity. Frequently, tremors and weak spasms occurred.—There was no appearance of rigor at 37 min. after death (temp. of laboratory, 58° F.).
288.	3 lbs. 9 oz.	5·3	4·5	0·25	5	Death, in 39 min. after the administration of physostigma.	*With atropia*, in 3 min., dilatation from $\frac{14}{50} \times \frac{13}{50}$ to $\frac{17}{50} \times \frac{17}{50}$. *After physostigma*, the size was in 2 min., $\frac{15}{50} \times \frac{15}{50}$; in 21 min., $\frac{18}{50} \times \frac{18}{50}$; and in 38 min., $\frac{18}{50} \times \frac{18}{50}$.—After death, it was in 1 min., $\frac{14}{50} \times \frac{14}{50}$; in 2 min., $\frac{11}{50} \times \frac{11}{50}$; in 25 min., $\frac{2}{50} \times \frac{3}{50}$; and in 45 min., $\frac{2}{50} \times \frac{3}{50}$.	*With atropia*, in 4 min. 30 sec., acceleration from 44 to 62 per 10 sec. *After physostigma*, the rate per 10 sec. was in 4 min., 60; in 9 min., 61; in 32 min., 62; and in 37 min., 36.	*With atropia*, in 4 min., acceleration from 20 to 24 per 10 sec. *After physostigma*, the rate per 10 sec. was in 2 min., 26; in 15 min., 24; in 25 min., 16; in 29 min., 10; and in 30 min., 2. Afterwards, only gasping movements occurred at irregular intervals.	*With atropia*, none. *After physostigma*, none. There was no salivation, defæcation, nor urination.	*With atropia*, none. *After physostigma*, in 5 min., slight fibrillary twitches, which disappeared before death, without becoming more prominent. In 19 min., slight paralysis; and in 25 min., general flaccidity. Tremors occurred frequently, and on one or two occasions there were some feeble spasms.—Rigor first began to set in at about 45 min. after death (temp. of laboratory, 57° F.).

Number of Experiment.	Weight of Rabbit.	Doses of Sulphate of Atropia (in Grains). Actual Dose.	Doses of Sulphate of Atropia (in Grains). Dose p. 3 lbs. of Animal.	Dose of Physostigma (in Grains). Actual Dose of Sul. of Physostigmia.	Interval of Time (in minutes).	Result.	Effect on the Pupils. (The Measurements are in fiftieths of an inch.)	Effect on the Heart.	Effect on the Respirations.	Effect on Secretion and Excretion.	Effects on Motility, &c.
289.	3 lbs.	5	5	0·18	5	Death, in 31 min. after the administration of physostigma.	*With atropia*, in 4 min., dilatation from $\frac{14}{50} \times \frac{13}{50}$ to $\frac{13}{50} \times \frac{13}{50}$. *After physostigma*, the size was in 6 min., $\frac{13}{50} \times \frac{13}{50}$; in 24 min., $\frac{28}{50} \times \frac{26}{50}$; and in 35 min. 30 sec., $\frac{28}{50} \times \frac{26}{50}$. —After death, it was in 1 min., $\frac{28}{50} \times \frac{28}{50}$; in 3 min., $\frac{14}{50} \times \frac{13}{50}$; in 27 min., $\frac{13}{50} \times \frac{13}{50}$; and in 2 hours, $\frac{14}{50} \times \frac{13}{50}$.	*With atropia*, none noted. The original rate was 41 per 10 sec. *After physostigma*, the rate per 10 sec. was in 25 min., 60; in 29 min., 32; and in 30 min. 30 sec., 20 (feeble).	*With atropia*, in 4 min. 30 sec., slowing from 22 to 18 per 10 sec. *After physostigma*, the rate per 10 sec. was in 6 min., 18; and in 23 min., 14. Afterwards, only feeble gasps occurred irregularly and infrequently.	*With atropia*, none. *After physostigma*, none. There was no salivation, defæcation, nor urination.	*With atropia*, none. *After physostigma*, in 4 min., slight fibrillary twitches, which soon became pretty well marked, but ceased before death. In 12 min., slight paralysis; and in 23 min., general flaccidity. Tremors occurred frequently.—There was no appearance of rigor at 2 hours after death (temp. of laboratory, 59° F.).
290. *a*	3 lbs. [Experiment *b* was performed six days after experiment *a*.]	0·05	0·05	0·18	10	Recovery.	*With atropia*, in 9 min., dilatation from $\frac{12}{50} \times \frac{9}{50}$ to $\frac{17}{50} \times \frac{13}{50}$. *After physostigma*, the size was in 20 min., $\frac{17}{50} \times \frac{13}{50}$; in 51 min., $\frac{13}{50} \times \frac{13}{50}$; and in 2 hours 43 min., $\frac{16}{50} \times \frac{14}{50}$.—On the following day, it was $\frac{11}{50} \times \frac{10}{50}$; and on the 7th day, $\frac{12}{50} \times \frac{10}{50}$.	*With atropia*, in 9 min. 30 sec., acceleration from 43 to 59 per 10 sec. *After physostigma*, the rate per 10 sec. was in 4 min., 64; in 47 min., 58; and in 1 hour 40 min., 58.—On the following day, it was 30; on the 3d day, 43; and on the 7th day, 40.	*With atropia*, in 7 min., acceleration from 24 to 27 per 10 sec. *After physostigma*, the rate per 10 sec. was in 2 min., 30; in 51 min., 21; in 1 hour 55 min., 22; and in 2 hours 47 min., 21.—On the following day, it was 19; and on the 7th day, 18.	*With atropia*, none. *After physostigma*, none. There was no salivation, defæcation, nor urination during the 3 hours of continuous observation.	*With atropia*, none. *After physostigma*, in 1 min. 30 sec., rare and slight fibrillary twitches, which soon became very well marked and continued so for more than 2 hours 30 min. In 5 min., slight paralysis; in 20 min., very decided paralysis; and in 2 hours 50 min., almost no paralysis. Occasionally, tremors and starts occurred.
b	3 lbs. 1 oz.	0	0	0·18	—	Death, in 14 min.	—	—	—	—	—
291. *a*	3 lbs. [Experiment *b* was performed six days after experiment *a*.]	0·05	0·05	0·18	15	Recovery.	*With atropia*, in 8 min., dilatation from $\frac{11}{50} \times \frac{10}{50}$ to $\frac{16}{50} \times \frac{16}{50}$. *After physostigma*, the size was in 7 min., $\frac{16}{50} \times \frac{16}{50}$; in 33 min., $\frac{16}{50} \times \frac{16}{50}$; in 1 hour 17 min., $\frac{15}{50} \times \frac{14}{50}$; and in 2 hours 10 min., $\frac{13}{50} \times \frac{13}{50}$.—On the following day, it was $\frac{15}{50} \times \frac{14}{50}$; and on 6th day, $\frac{13}{50} \times \frac{13}{50}$.	*With atropia*, in 13 min., acceleration from 41 to 60 per 10 sec. *After physostigma*, the rate per 10 sec. was in 3 min., 61; in 5 min., 52; in 46 min., 44; and in 2 hours 11 min., 39.—On the following day, it was 26; and on the 5th day, 41.	*With atropia*, in 12 min., slowing from 19 to 17 per 10 sec. *After physostigma*, the rate per 10 sec. was in 2 min., 24; in 9 min., 29; in 1 hour 18 min., 20; and in 2 hours 10 min., 21.—On the following day, it was 22; and on the 6th day, 18.	*With atropia*, none. *After physostigma*, none. There was no salivation, defæcation, nor urination during the 4 hours of continuous observation.	*With atropia*, none. *After physostigma*, in 1 min. 30 sec., slight and rare fibrillary twitches, which soon became very well marked, and continued so for more than 3 hours. In 12 min., slight paralysis; in 45 min., very decided paralysis; and in 4 hours, only slight paralysis.
b	3 lbs.	0	0	0·12	—	Death, in 23 min.	—	—	—	—	—

Number of Experiment.	Weight of Rabbit.	Doses of Sulphate of Atropia (in Grains). Actual Dose.	Doses of Sulphate of Atropia (in Grains). Dose p. 3 lbs. of Animal.	Dose of Physostigma (in Grains). Actual Dose of Sul. of Physostigmia.	Interval of Time (in minutes).	Result.	Effect on the Pupils. (The Measurements are in fiftieths of an inch.)	Effect on the Heart.	Effect on the Respirations.	Effect on Secretion and Excretion.	Effects on Motility, &c.
292. *a* [Experiment *b* was performed seven days after experiment *a*.]	3 lbs. 1 oz.	0·05	0·05	0·18	20	Recovery.	*With atropia*, in 12 min., dilatation from $\frac{13}{50} \times \frac{13}{50}$ to $\frac{16}{50} \times \frac{17}{50}$. *After physostigma*, the size was in 5 min., $\frac{16}{50} \times \frac{17}{50}$; in 2 hours, $\frac{15}{50} \times \frac{17}{50}$; and in 3 hours, $\frac{15}{50} \times \frac{13}{50}$. — On the 3d day, it was $\frac{13}{50} \times \frac{13}{50}$; and on the 8th day, $\frac{13}{50} \times \frac{11}{50}$.	*With atropia*, in 16 min., acceleration from 44 to 61 per 10 sec. *After physostigma*, the rate per 10 sec. was in 4 min., 61; in 11 min., 53; in 40 min., 46; in 1 hour 21 min., 42; and in 3 hours 5 min., 43.—On the following day, it was 35; on the 3d day, 44; and on the 8th day, 42.	*With atropia*, in 12 min, slowing from 27 to 23 per 10 sec.; and in 19 min., acceleration to 29. *After physostigma*, the rate per 10 sec. was in 3 min., 30; in 40 min., 25; in 1 hour 20 min., 19; and in 3 hours 4 min., 23.—On the following day, it was 20; and on the 8th day, 17.	*With atropia*, none. *After physostigma*, in 1 hour 14 min., urine was voided. There was neither salivation nor defæcation during the 3 hours 30 min. of continuous observation.	*With atropia*, none. *After physostigma*, in 1 min. 30 sec., rare and slight fibrillary twitches, which became very well marked, and continued for more than 3 hours, though latterly in a less prominent form. In 13 min., slight paralysis; in 1 hour 10 min., very advanced paralysis; and in 3 hours, distinct, though comparatively slight, paralysis. Frequently, there were tremors and feeble spasms.
b	2 lbs. 15½ oz.	0	0	0·17 (= about 0·18 gr. p. 3 lbs.)	—	Death, in 15 min.	—	—	—	—	—
293.	3 lbs. 10 oz.	0·06	0·05	0·217	25	Death, in 49 min. after the administration of physostigma.	*With atropia*, in 19 min., dilatation from $\frac{11}{50} \times \frac{11}{50}$ to $\frac{17}{50} \times \frac{17}{50}$. *After physostigma*, the size was in 10 min., $\frac{17}{50} \times \frac{17}{50}$; in 25 min., $\frac{17}{50} \times \frac{17}{50}$; in 30 min., $\frac{9}{50} \times \frac{9}{50}$; in 34 min., $\frac{9}{50} \times \frac{7}{50}$; in 38 min., $\frac{12}{50} \times \frac{12}{50}$; in 40 min., $\frac{7}{50} \times \frac{9}{50}$; in 46 min., $\frac{12}{50} \times \frac{12}{50}$; and in 49 min., $\frac{12}{50} \times \frac{12}{50}$.—After death, it was in 3 min., $\frac{12}{50} \times \frac{12}{50}$; in 11 min., $\frac{7}{50} \times \frac{7}{50}$; in 14 min., $\frac{10}{50} \times \frac{10}{50}$; and in 1 hour, $\frac{14}{50} \times \frac{14}{50}$.	*With atropia*, in 23 min., acceleration from 42 to 59 per 10 sec. *After physostigma*, the rate per 10 sec. was in 5 min., 46; in 15 min., 43; in 26 min., 23; and in 42 min., 12.	*With atropia*, in 24 min., slowing from 21 to 19 per 10 sec. *After physostigma*, the rate per 10 sec. was in 3 min., 21; in 16 min., 26; in 27 min., 18; and in 34 min., 10. Afterwards, only infrequent laboured gasps occurred.	*With atropia*, none. *After physostigma*, in 36 min., several normal fæcal pellets were passed; and in 34 min., salivation commenced, and it continued until death.	*With atropia*, none. *After physostigma*, in 2 min., slight fibrillary twitches, which by-and-by became very well marked, but were again only slight for several minutes before death. In 9 min., extension of the limbs; in 11 min., distinct paralysis; and in 31 min., general flaccidity. There were frequent tremors.—Rigor began to set in at 42 min. after death (temp. of laboratory, 60° F.).
294.	3 lbs. 2 oz.	0·052	0·05	0·19	30	Death, in 19 min. after the administration of physostigma.	*With atropia*, in 21 min., dilatation from $\frac{13}{50} \times \frac{14}{50}$ to $\frac{18}{50} \times \frac{18}{50}$. *After physostigma*, the size was in 9 min., $\frac{13}{50} \times \frac{13}{50}$; in 16 min., $\frac{16}{50} \times \frac{16}{50}$; in 17 min., $\frac{7}{50} \times \frac{9}{50}$; and in 18 min. 30 sec., $\frac{10}{50} \times \frac{9}{50}$.—After death, it was in 1 min., $\frac{9}{50} \times \frac{8}{50}$; in 4 min., $\frac{7}{50} \times \frac{8}{50}$; in 1 hour, $\frac{11}{50} \times \frac{10}{50}$; and in 1 hour 20 min., $\frac{12}{50} \times \frac{11}{50}$.	*With atropia*, in 8 min., acceleration from 40 to 60 per 10 sec., this rate being also present at 29 min. *After physostigma*, the rate per 10 sec. was in 5 min., 43; in 7 min., 32; and in 16 min. 30 sec., 16.	*With atropia*, none. The original rate was 22 per 10 sec. *After physostigma*, the rate per 10 sec. was in 6 min., 24; in 7 min., 17; and in 9 min., 16. Soon afterwards, the respirations became irregular, infrequent, and gasping, and also accompanied with moist sounds.	*With atropia*, in 17 min., urine was voided; and in 27 min., several normal fæcal pellets were passed. *After physostigma*, in 7 min., slight increase in the secretion of certain buccal glands, and by-and-by a little salivation. In 10 min. and in 15 min., several fæcal pellets were passed. There was no urination.	*With atropia*, none. *After physostigma*, in 2 min., slight fibrillary twitches, which soon became pretty well marked. In 10 min., extension of the limbs; in 12 min., decided paralysis; and in 16 min., general flaccidity. Occasionally, there were some feeble tremors.—Rigor began to set in at 45 min. after death (temp. of laboratory, 58° F.).

Number of Experiment.	Weight of Rabbit.	Doses of Sulphate of Atropia (in Grains). Actual Dose.	Doses of Sulphate of Atropia (in Grains). Dose p. 3 lbs. of Animal.	Dose of Physostigma (in Grains). Actual Dose of Sul. of Physostigmia.	Interval of Time (in minutes).	Result.	Effect on the Pupils. (The Measurements are in fiftieths of an inch.)	Effect on the Heart.	Effect on the Respirations.	Effect on Secretion and Excretion.	Effects on Motility, &c.
295. *a* [Experiment *b* was performed seven days after experiment *a*.]	3 lbs.	0·5	0·5	0·18	15	Recovery.	*With atropia*, in 14 min., dilatation from $\frac{13}{50} \times \frac{11}{50}$ to $\frac{15}{50} \times \frac{15}{50}$. *After physostigma*, the size was in 10 min., $\frac{15}{50} \times \frac{15}{50}$; and in 3 hours, $\frac{15}{50} \times \frac{15}{50}$.—On the following day, it was $\frac{15}{50} \times \frac{15}{50}$; on the 4th day, $\frac{14}{50} \times \frac{13}{50}$; and on the 8th day, $\frac{11}{50} \times \frac{10}{50}$.	*With atropia*, in 14 min. 30 sec., acceleration from 41 to 60 per 10 sec. *After physostigma*, the rate per 10 sec. was in 5 min., 60; and in 1 hour 46 min., 38.—On the following day, it was 28; on the 3d day, 30; on the 4th day, 40; and on the 8th day, 41.	*With atropia*, in 13 min., acceleration from 37 to 41 per 10 sec. *After physostigma*, the rate per 10 sec. was in 3 min., 42; in 26 min., 40; in 48 min., 26; and in 1 hour 47 min., 28.—On the following day, it was 23; and on the 8th day, 21.	*With atropia*, none. *After physostigma*, in 46 min., slight increase in the secretion of certain buccal glands. In 51 min., in 1 hour 8 min., and in 1 hour 45 min., several fæcal pellets were passed; and in 1 hour 8 min., a little urine was voided.	*With atropia*, in 12 min., slight restlessness. *After physostigma*, in 2 min., slight fibrillary twitches, which became very well marked, and continued so for more than 3 hours. In 14 min., slight paralysis; in 46 min., pretty advanced paralysis; and in 2 hours 30 min., only slight paralysis. Frequently, tremors occurred.
b	2 lbs. 15 oz.	0	0	0·12 (= about 0·12 gr. p. 3 lbs.)	—	Death, in 23 min.	—	—	—	—	—
296. *a* [Experiment *b* was performed six days after experiment *a*.]	3 lbs. 11 oz.	0·61	0·5	0·22	25	Recovery.	*With atropia*, in 23 min., dilatation from $\frac{10}{50} \times \frac{9}{50}$ to $\frac{16}{50} \times \frac{16}{50}$. *After physostigma*, the size was in 20 min., $\frac{16}{50} \times \frac{16}{50}$; in 36 min., (R.P.) $\frac{18}{50} \times \frac{18}{50}$, (L.P.) $\frac{14}{50} \times \frac{13}{50}$; in 46 min. (both), $\frac{11}{50} \times \frac{10}{50}$; and in 1 hour 40 min., $\frac{11}{50} \times \frac{10}{50}$.—On the following day, it was $\frac{16}{50} \times \frac{16}{50}$; on the 3d day, $\frac{13}{50} \times \frac{13}{50}$; on the 4th day, $\frac{11}{50} \times \frac{10}{50}$; and on the 7th day, $\frac{10}{50} \times \frac{9}{50}$.	*With atropia*, in 18 min., acceleration from 39 to 60 per 10 sec. *After physostigma*, the rate per 10 sec. was in 7 min., 52; in 17 min., 46; in 40 min., 50; and in 1 hour 15 min., 42.—On the following day, it was 30; on the 3d day, 40; and on the 7th day, 43.	*With atropia*, none. The original rate was 32 per 10 sec. *After physostigma*, the rate per 10 sec. was in 9 min., 37; in 48 min., 28; and in 1 hour 20 min., 19.—On the following day, it was 25; and on the 7th day, 27.	*With atropia*, in 18 min., several fæcal pellets were passed. *After physostigma*, in 17 min., and in 30 min., several fæcal pellets were passed; and in 30 min., urine was voided. There was no salivation.	*With atropia*, in 16 min., slight restlessness. *After physostigma*, in 5 min., rare and slight fibrillary twitches, which by-and-by became well marked, and continued so for more than 1 hour. In 17 min., slight paralysis; in 35 min., decided paralysis; and in 1 hour 40 min., only slight paralysis. Occasionally, some spasmodic movements occurred.
b	3 lbs. 10 oz.	0	0	0·145 (= 0·12 gr. p. 3 lbs.)	—	Death, in 17 min.	—	—	—	—	—
297. *a* [Experiment *b* was performed nine days after experiment *a*.]	3 lbs.	0·5	0·5	0·18	30	Recovery.	*With atropia*, in 10 min., dilatation from $\frac{14}{50} \times \frac{14}{50}$ to $\frac{17}{50} \times \frac{17}{50}$. *After physostigma*, the size was in 7 min., $\frac{17}{50} \times \frac{17}{50}$; and in 2 hours, $\frac{17}{50} \times \frac{17}{50}$.—On the following day, it was $\frac{17}{50} \times \frac{17}{50}$; on the 3d day, $\frac{15}{50} \times \frac{15}{50}$; and on the 10th day, $\frac{15}{50} \times \frac{15}{50}$.	*With atropia*, in 9 min., acceleration from 43 to 62 per 10 sec., and in 25 min., to 65. *After physostigma*, the rate per 10 sec. was in 6 min., 57; in 9 min., 43; in 31 min., 48; and in 2 hours, 48.—On the following day, it was 30; on the 3d day, 39; and on the 10th day, 38.	*With atropia*, in 27 min., acceleration from 22 to 26 per 10 sec. *After physostigma*, the rate per 10 sec. was in 7 min., 17; in 29 min., 16; and in 2 hours 2 min., 19.—On the following day, it was 17; and on the 10th day, 13.	*With atropia*, none. *After physostigma*, in 6 min., several fæcal pellets were passed. Neither salivation nor urination occurred during the 2 hours 40 min. of continuous observation.	*With atropia*, in 10 min., slight restlessness. *After physostigma*, in 2 min., infrequent fibrillary twitches, which became pretty well marked, and continued so for more than 1 hour 50 min. In 17 min., slight paralysis; in 28 min., distinct, but not very advanced paralysis; and in 1 hour 40 min., only slight paralysis. Occasionally, there were some gentle tremors.
b	2 lbs. 15 oz.	0	0	0·175 (= 0·18 gr. p. 3 lbs.)	—	Death in 11 min.	—	—	—	—	—

Number of Experiment.	Weight of Rabbit.	Doses of Sulphate of Atropia (in Grains). Actual Dose.	Doses of Sulphate of Atropia (in Grains). Dose p. 3 lbs. of Animal.	Dose of Physostigma (in Grains). Actual Dose of Sul. of Physostigmia.	Interval of Time (in minutes).	Result.	Effect on the Pupils. (The Measurements are in fiftieths of an inch.)	Effect on the Heart.	Effect on the Respirations.	Effect on Secretion and Excretion.	Effects on Motility, &c.
298.	3 lbs. 8 oz.	0·58	0·5	0·21	35	Death, in 1 hour 17 min. after the administration of physostigma.	*With atropia*, in 10 min., dilatation from $\frac{1}{50} \times \frac{1}{50}$ to $\frac{15}{50} \times \frac{15}{50}$, the latter being the size also at 34 min. *After physostigma*, the size was in 5 min., $\frac{12}{50} \times \frac{12}{50}$; in 40 min., $\frac{19}{50} \times \frac{19}{50}$; in 1 hour, $\frac{15}{50} \times \frac{15}{50}$; in 1 hour 8 min., $\frac{7}{50} \times \frac{7}{50}$; in 1 hour 15 min., $\frac{7}{50} \times \frac{9}{50}$; and in 1 hour 17 min., $\frac{10}{50} \times \frac{10}{50}$.—After death, it was in 2 min., $\frac{10}{50} \times \frac{10}{50}$; in 12 min., $\frac{9}{50} \times \frac{9}{50}$; and in 42 min., $\frac{11}{50} \times \frac{11}{50}$.	*With atropia*, in 20 min., acceleration from 40 to 60 per 10 sec., the latter being the rate also at 34 min. *After physostigma*, the rate per 10 sec. was in 5 min., 60; in 1 hour, 42; and in 1 hour 12 min., 18.	*With atropia*, in 34 min. 30 sec., acceleration from 40 to 42 per 10 sec. *After physostigma*, the rate per 10 sec. was in 8 min., 45; in 15 min., 32; in 32 min., 30; in 40 min., 18; in 55 min., 16; and in 1 hour 9 min., 8. Afterwards, only laboured, noisy, and gasping respirations occurred.	*With atropia*, none. *After physostigma*, in 43 min., slight salivation, which soon became pretty abundant, and was accompanied with noisy respirations. In 1 hour 10 min., several fæcal pellets were passed, and urine was voided.	*With atropia*, in 33 min., slight restless movements of head. *After physostigma*, in 2 min., slight fibrillary twitches, which soon became pretty well marked, but afterwards lessened greatly. In 13 min., slight paralysis; and in 1 hour 10 min., general flaccidity. Tremors and starts occurred frequently.—There was no appearance of rigor at 43 min. after death (temp. of laboratory, 62° F.).
299.	3 lbs.	0·5	0·5	0·18	40	Death, in 1 hour 13 min. after the administration of physostigma.	*With atropia*, in 7 min., dilatation from $\frac{15}{50} \times \frac{15}{50}$ to $\frac{17}{50} \times \frac{17}{50}$. In 37 min., the size was also $\frac{17}{50} \times \frac{17}{50}$. *After physostigma*, the size was in 5 min., $\frac{17}{50} \times \frac{17}{50}$; in 10 min., $\frac{15}{50} \times \frac{15}{50}$; in 40 min., $\frac{13}{50} \times \frac{14}{50}$; in 52 min., $\frac{12}{50} \times \frac{13}{50}$; and in 1 hour 12 min., $\frac{11}{50} \times \frac{11}{50}$.—After death, it was in 3 min., $\frac{10}{50} \times \frac{10}{50}$; and in 38 min., $\frac{11}{50} \times \frac{11}{50}$.	*With atropia*, in 4 min., acceleration from 39 to 61 per 10 sec. In 38 min., the rate was 57 per 10 sec. *After physostigma*, the rate per 10 sec. was in 4 min., 49; in 24 min., 36; in 53 min., 25; and in 1 hour 10 min., 11.	*With atropia*, none. The original rate was 19 per 10 sec. *After physostigma*, the rate per 10 sec. was in 9 min., 22; in 25 min., 18; in 1 hour 5 min., 10; and in 1 hour 10 min., 6. Afterwards, only laboured and infrequent gasps occurred irregularly.	*With atropia*, in 23 min., several fæcal pellets were passed. *After physostigma*, in 15 min., and in 35 min., urine was freely voided. In 35 min., and in 50 min., fæcal pellets were passed, on the latter occasion, wet on the surface. In 58 min., salivation commenced; and afterwards, the respirations were often noisy.	*With atropia*, none. *After physostigma*, in 1 min. 20 sec., rare fibrillary twitches, which by-and-by became well marked. In 12 min., slight paralysis; in 28 min., decided paralysis; and in 1 hour 5 min., general flaccidity. Occasionally, there were some feeble tremors.—Rigor began to set in at 37 min. after death (temp. of laboratory, 58° F.).
300. *a*	2 lbs. 15½ oz.	1·5	1·5	0·18	15	Recovery.	*With atropia*, in 2 min., dilatation from $\frac{10}{50} \times \frac{9}{50}$ to $\frac{15}{50} \times \frac{15}{50}$. *After physostigma*, the size was in 3 min., $\frac{15}{50} \times \frac{15}{50}$; in 50 min., $\frac{13}{50} \times \frac{13}{50}$; and in 1 hour 10 min., $\frac{13}{50} \times \frac{11}{50}$.—On the 3d day, it was $\frac{15}{50} \times \frac{13}{50}$; on the 4th day, $\frac{10}{50} \times \frac{10}{50}$; and on the 12th day, $\frac{10}{50} \times \frac{9}{50}$.	*With atropia*, in 4 min., acceleration from 39 to 59 per 10 sec. *After physostigma*, the rate per 10 sec. was in 5 min., 59; in 11 min., 61; in 30 min., 50; in 50 min., 45; and in 1 hour 5 min., 42.—On the 3d day, it was 32; on the 4th day, 28; and on the 12th day, 43.	*With atropia*, in 14 min., acceleration from 22 to 23 per 10 sec. *After physostigma*, the rate per 10 sec. was in 11 min., 25; in 20 min., 19; in 30 min., 16; and in 1 hour 6 min., 15.—On the 3d day, it was 21; on the 4th day, 20; and on 12th day, 24.	*With atropia*, none. *After physostigma*, in 9 min., in 1 hour 5 min., and in 2 hours 25 min., fæcal pellets were passed, on the last occasion, wet on the surface. In 46 min., urine was freely voided. There was no salivation.	*With atropia*, in 5 min., slight restlessness. *After physostigma*, in 2 min., rare fibrillary twitches, which became well marked, and continued for more than 2 hours. In 18 min., slight paralysis; in 45 min., decided paralysis; and in 1 hour 10 min., only slight paralysis. There were no tremors.
	[Experiment *b* was performed eleven days after experiment *a*.]										
b	3 lbs.	0	0	0·18	—	Death, in 18 min.	—	—	—	—	—

Number of Experiment.		Weight of Rabbit.	Doses of Sulphate of Atropia (in Grains). Actual Dose.	Doses of Sulphate of Atropia (in Grains). Dose p. 3 lbs. of Animal.	Dose of Physostigma (in Grains). Actual Dose of Sul. of Physostigmia.	Interval of Time (in minutes).	Result.	Effect on the Pupils. (The Measurements are in fiftieths of an inch.)	Effect on the Heart.	Effect on the Respirations.	Effect on Secretion and Excretion.	Effects on Motility, &c.
301.	*a*	2 lbs. 15 oz. [Experiment *b* was performed eight days after experiment *a*.]	1·46	1·5	0·176	30	Recovery.	*With atropia*, in 5 min., dilatation from $\frac{11}{50} \times \frac{10}{50}$ to $\frac{16}{50} \times \frac{15}{50}$, the latter being the size also at 28 min. *After physostigma*, the size was in 5 min., $\frac{10}{50} \times \frac{10}{50}$; in 40 min., $\frac{15}{50} \times \frac{15}{50}$; and in 1 hour, $\frac{10}{50} \times \frac{10}{50}$.—On the following day, it was $\frac{15}{50} \times \frac{15}{50}$; on the 6th day, $\frac{11}{50} \times \frac{10}{50}$; and on the 9th day, $\frac{11}{50} \times \frac{10}{50}$.	*With atropia*, in 6 min., acceleration from 41 to 61 per 10 sec. In 29 min., the rate per 10 sec. was 53. *After physostigma*, the rate per 10 sec. was in 4 min., 51; in 11 min., 46; in 20 min., 55; and in 1 hour 5 min., 40.—On the following day, it was 29; on the 3d day, 39; and on the 9th day, 42.	*With atropia*, none. The original rate was 23 per 10 sec. *After physostigma*, the rate per 10 sec. was in 3 min., 20; in 8 min., 19; in 25 min., 17; in 55 min., 15; and in 1 hour, 15.—On the following day, it was 15; on the 3d day, 21; on the 5th day, 15; and on the 9th day, 17.	*With atropia*, none. *After physostigma*, none. There was no defæcation, urination, nor salivation during the 1 hour 40 min. of continuous observation.	*With atropia*, slight restlessness. *After physostigma*, in 1 min. 30 sec., rare fibrillary twitches, which soon became very well marked, and continued for more than 1 hour. In 17 min., extension of the limbs; in 18 min., distinct paralysis; in 40 min., very decided paralysis; and in 1 hour, only slight paralysis. Occasionally, some tremors and starts occurred.
	b	2 lbs. 15½ oz.	0	0	0·17 (= 0·18 gr. p. 3 lbs.)	—	Death, in 14 min.	—	—	—	—	—
302.	*a*	3 lbs. [Experiment *b* was performed six days after experiment *a*.]	1·5	1·5	0·18	40	Recovery.	*With atropia*, in 4 min., dilatation from $\frac{12}{50} \times \frac{12}{50}$ to $\frac{16}{50} \times \frac{15}{50}$. In 39 min. the size was $\frac{15}{50} \times \frac{15}{50}$. *After physostigma*, the size was in 3 min., $\frac{15}{50} \times \frac{15}{50}$; in 30 min., $\frac{15}{50} \times \frac{15}{50}$; and in 1 hour 15 min., $\frac{15}{50} \times \frac{15}{50}$.—On the following day, it was $\frac{17}{50} \times \frac{17}{50}$; on the 4th day, $\frac{15}{50} \times \frac{15}{50}$; and on the 7th day, $\frac{15}{50} \times \frac{15}{50}$.	*With atropia*, in 3 min., acceleration from 41 to 55 per 10 sec. In 35 min., the rate per 10 sec. was 54. *After physostigma*, the rate per 10 sec. was in 15 min., 52; in 40 min., 45; in 1 hour 16 min., 40; and in 1 hour 35 min., 38.—On the following day, it was 33; on the 4th day, 42; and on the 7th day, 41.	*With atropia*, in 34 min., acceleration from 30 to 37 per 10 sec. *After physostigma*, the rate per 10 sec. was in 4 min., 38; in 27 min., 24; in 40 min., 18; and in 1 hour 35 min., 19.—On the following day, it was 30; and on the 7th day, 22.	*With atropia*, in 4 min., several fæcal pellets were passed. *After physostigma*, none. There was no defæcation, urination, nor salivation during the 1 hour 45 min. of continuous observation.	*With atropia*, after 11 min., there were constant restless movements. *After physostigma*, in 2 min., rare fibrillary twitches, which soon became well marked, and continued for more than 1 hour 40 min. In 12 min., slight paralysis; in 20 min., decided paralysis; and in 1 hour 45 min., only slight paralysis. Occasionally, tremors and starts occurred; and at 1 hour 40 min., there were some convulsive movements.
	b	3 lbs.	0	0	0·18	—	Death, in 12 min.	—	—	—	—	—

Number of Experiment.	Weight of Rabbit.	Doses of Sulphate of Atropia (in Grains). Actual Dose.	Doses of Sulphate of Atropia (in Grains). Dose p. 3 lbs. of Animal.	Dose of Physostigma (in Grains). Actual Dose of Sul. of Physostigmia.	Interval of Time (in minutes).	Result.	Effect on the Pupils. (The Measurements are in fiftieths of an inch.)	Effect on the Heart.	Effect on the Respirations.	Effect on Secretion and Excretion.	Effects on Motility, &c.
303. *a* [Experiment *b* was performed eleven days after experiment *a*.]	3 lbs. 3 oz.	1·59	1·5	0·19	60	Recovery.	*With atropia*, in 4 min., dilatation from $\frac{3}{50} \times \frac{3}{50}$ to $\frac{17}{50} \times \frac{17}{50}$. In 58 min., the size was $\frac{18}{50} \times \frac{18}{50}$. *After physostigma*, the size was in 30 min., $\frac{8}{50} \times \frac{8}{50}$; in 1 hour, $\frac{8}{50} \times \frac{8}{50}$; and in 2 hours, $\frac{8}{50} \times \frac{8}{50}$.—On the following day, it was $\frac{17}{50} \times \frac{17}{50}$; on the 5th day, $\frac{15}{50} \times \frac{15}{50}$; and on the 12th day, $\frac{13}{50} \times \frac{13}{50}$.	*With atropia*, in 57 min., acceleration from 42 to 60 per 10 sec. *After physostigma*, the rate per 10 sec. was in 4 min., 58; in 24 min., 42; in 1 hour 35 min., 27; and in 2 hours, 32.—On the following day, it was 31; on the 5th day, 37; and on the 12th day, 39.	*With atropia*, in 59 min., slowing from 33 to 23 per 10 sec. *After physostigma*, the rate per 10 sec. was in 3 min., 17; in 9 min., 44; in 21 min., 22; in 1 hour 17 min., 35; and in 2 hours 2 min., 32.—On the following day, it was 17; on the 5th day, 21; and on the 12th day, 18.	*With atropia*, in 55 min., several normal fæcal pellets were passed. *After physostigma*, in 25 min., salivation commenced, and soon became profuse. In 49 min., urine was freely voided; and in 1 hour 45 min., a large quantity of semi-liquid fæces were passed.	*With atropia*, after 18 min., slight restlessness was present. *After physostigma*, in 1 min. 30 sec., rare fibrillary twitches, which afterwards became very well marked, and continued for more than 1 hour 40 min. In 11 min., slight paralysis; in 19 min., very decided paralysis; and in 2 hours, slight, though still distinct, paralysis. Frequently, tremors occurred.
	b	3 lbs. 4 oz.	0	0	0·19 (= 0·18 gr. p. 3 lbs.)	—	Death, in 19 min.	—	—	—	—	—
304. *a* [Experiment *b* was performed eight days after experiment *a*.]	3 lbs.	1·5	1·5	0·18	65	Recovery.	*With atropia*, in 4 min., dilatation from $\frac{14}{50} \times \frac{13}{50}$ to $\frac{16}{50} \times \frac{16}{50}$. In 62 min., the size was $\frac{16}{50} \times \frac{16}{50}$. *After physostigma*, the size was in 10 min., $\frac{16}{50} \times \frac{16}{50}$; in 30 min., $\frac{17}{50} \times \frac{17}{50}$; and in 2 hours 10 min., $\frac{17}{50} \times \frac{17}{50}$.—On the following day, it was $\frac{17}{50} \times \frac{17}{50}$; and on the 9th day, $\frac{14}{50} \times \frac{13}{50}$.	*With atropia*, in 6 min., acceleration from 42 to 61 per 10 sec. In 63 min., the rate per 10 sec. was 62. *After physostigma*, the rate per 10 sec. was in 5 min., 61; in 31 min., 43; in 50 min., 32; in 1 hour 43 min., 42; and in 2 hours 15 min., 42.—On the following day, it was 32; and on the 9th day, 40.	*With atropia*, in 10 min., slowing from 15 to 13 per 10 sec.; and in 62 min., to 10. *After physostigma*, the rate per 10 sec. was in 10 min., 16; in 40 min., 11; in 1 hour 40 min., 13; and in 2 hours 14 min., 12.—On the following day, it was 11; and on the 9th day, 15.	*With atropia*, none. *After physostigma*, none. There was no defæcation, urination, nor salivation during the 2 hours 20 min. of continuous observation.	*With atropia*, in 6 min., restlessness, which continued for about 40 min. *After physostigma*, in 1 min. 30 sec., rare fibrillary twitches, which by-and-by became well marked, and continued for more than 2 hours. In 18 min., distinct paralysis; in 40 min., very decided paralysis; and in 2 hours 20 min., distinct but greatly lessened paralysis.
	b	3 lbs.	0	0	0·18	—	Death, in 12 min.	—	—	—	—	—
305.		2 lbs. 14 oz.	1·43	1·5	0·17	70	Death, in 1 hour after the administration of physostigma.	*With atropia*, in 7 min., dilatation from $\frac{14}{50} \times \frac{13}{50}$ to $\frac{17}{50} \times \frac{17}{50}$. In 65 min., the size was $\frac{17}{50} \times \frac{17}{50}$. *After physostigma*, the size was in 15 min., $\frac{16}{50} \times \frac{16}{50}$; in 35 min., $\frac{17}{50} \times \frac{17}{50}$; in 53 min., $\frac{18}{50} \times \frac{18}{50}$; and in 1 hour, $\frac{18}{50} \times \frac{18}{50}$.—After death, the size was in 2 min., $\frac{18}{50} \times \frac{18}{50}$; in 5 min., $\frac{16}{50} \times \frac{16}{50}$; in 25 min., $\frac{14}{50} \times \frac{14}{50}$; and in 37 min., $\frac{13}{50} \times \frac{13}{50}$.	*With atropia*, in 5 min., acceleration from 40 to 60 per 10 sec.; and in 66 min., to 62. *After physostigma*, the rate per 10 sec. was in 7 min., 48; in 50 min., 36; in 54 min., 24; and in 56 min., 14.	*With atropia*, none. The original rate was 23 per 10 sec. *After physostigma*, the rate per 10 sec. was in 10 min., 31; in 20 min., 22; in 41 min., 12; and in 45 min., 9. Afterwards, only infrequent gasps occurred irregularly until death.	*With atropia*, none. *After physostigma*, none.	*With atropia*, in 3 min., restlessness, which continued for about 28 min. *After physostigma*, in 2 min., rare fibrillary twitches, which became pretty well marked, but ceased before death. In 10 min., slight paralysis; in 19 min., decided paralysis; and in 46 min., general flaccidity. There were frequent tremors.—Rigor began to set in at 37 min. after death (temp. of laboratory, 61° F.).

Number of Experiment.	Weight of Rabbit.	Doses of Sulphate of Atropia (in Grains). Actual Dose.	Doses of Sulphate of Atropia (in Grains). Dose p. 3 lbs. of Animal.	Dose of Physostigma (in Grains). Actual Dose of Sul. of Physostigmia.	Interval of Time in (minutes).	Result.	Effect on the Pupils. (The Measurements are in fiftieths of an inch.)	Effect on the Heart.	Effect on the Respirations.	Effect on Secretion and Excretion.	Effects on Motility, &c.
306.	3 lbs.	1·5	1·5	0·18	80	Death, in 47 min. after the administration of physostigma.	*With atropia*, in 3 min., dilatation from $\frac{14}{50} \times \frac{13}{50}$; to $\frac{16}{50} \times \frac{16}{50}$; and in 5 min., to $\frac{17}{50} \times \frac{17}{50}$. *After physostigma*, the size was in 13 min., $\frac{17}{50} \times \frac{17}{50}$; in 30 min., $\frac{17}{50} \times \frac{17}{50}$; and in 47 min., $\frac{17}{50} \times \frac{17}{50}$.—After death, it was in 4 min., $\frac{13}{50} \times \frac{13}{50}$; in 6 min., $\frac{7}{50} \times \frac{6}{50}$; and in 52 min., $\frac{10}{50} \times \frac{10}{50}$.	*With atropia*, in 5 min., acceleration from 40 to 61 per 10 sec.; and in 70 min., to 63. *After physostigma*, the rate per 10 sec. was in 5 min., 54; in 17 min., 40; in 29 min., 30; in 38 min., 18; and in 40 min., 15.	*With atropia*, in 6 min., acceleration from 20 to 22 per 10 sec.; and in 79 min., slowing to 19. *After physostigma*, the rate per 10 sec. was in 15 min., 24; in 25 min., 12; in 34 min., 8; and in 43 min., 5. Afterwards, mere gasps occurred infrequently.	*With atropia*, in 12 min., and in 70 min., fæcal pellets were passed; and in 43 min., urine was freely voided. *After physostigma*, in 27 min., salivation commenced and continued until death. In 28 min., several fæcal pellets were passed. In 32 min., urine was voided.	*With atropia*, in 7 min., restlessness, which had ceased at 24 min. *After physostigma*, in 2 min., rare fibrillary twitches, which became well marked, and continued until several min. after death. In 13 min., slight paralysis; in 25 min., very decided paralysis; and in 40 min., general flaccidity. Occasionally, tremors occurred.—Rigor began to set in at about 53 min. after death (temp. of laboratory, 58° F.).
307. *a*	3 lbs. [Experiment *b* was performed ten days after experiment *a*.]	3	3	0·18	40	Recovery.	*With atropia*, in 37 min., dilatation from $\frac{15}{50} \times \frac{14}{50}$ to $\frac{18}{50} \times \frac{18}{50}$. *After physostigma*, the size was in 1 hour 10 min., $\frac{18}{50} \times \frac{18}{50}$.	*With atropia*, in 35 min., acceleration from 41 to 55 per 10 sec. *After physostigma*, the rate per 10 sec. was in 9 min., 48; and in 1 hour 6 min., 40.	*With atropia*, none. The original rate was 14 per 10 sec. *After physostigma*, the rate per 10 sec. was in 2 min., 15; in 10 min., 13; and in 1 hour 7 min., 12.	*With atropia*, none. *After physostigma*, none. There was no defæcation, urination, nor salivation during the 1 hour 15 min. of continuous observation.	*With atropia*, restlessness. *After physostigma*, in 3 min., slight fibrillary twitches, which afterwards increased somewhat, and then ceased. In 20 min., distinct paralysis; and in 1 hour 15 min., only slight paralysis. Occasionally, there were some feeble tremors.
b	3 lbs. 1 oz.	0	0	0·12	—	Death, in 30 min.	—	—	—	—	—
308. *a*	3 lbs. 4 oz. [Experiment *b* was performed twelve days after experiment *a*.]	3·25	3	0·2	65	Recovery.	*With atropia*, in 3 min., dilatation from $\frac{14}{50} \times \frac{13}{50}$ to $\frac{17}{50} \times \frac{17}{50}$. In 50 min., the size was $\frac{18}{50} \times \frac{18}{50}$. *After physostigma*, the size was in 11 min., $\frac{18}{50} \times \frac{18}{50}$; and in 1 hour 20 min., $\frac{17}{50} \times \frac{17}{50}$.—On the following day, it was $\frac{17}{50} \times \frac{17}{50}$; on the 4th day, $\frac{16}{50} \times \frac{16}{50}$; and on the 13th day, $\frac{15}{50} \times \frac{15}{50}$.	*With atropia*, in 4 min., acceleration from 37 to 57 per 10 sec.; and in 52 min., to 60. *After physostigma*, the rate per 10 sec. was in 5 min., 55; in 35 min., 49; and in 1 hour 15 min., 51.—On the 3d day, it was 38; and on the 13th day, 43.	*With atropia*, in 50 min., slowing from 22 to 20 per 10 sec. *After physostigma*, the rate per 10 sec. was in 11 min., 18; in 40 min., 16; and in 1 hour 20 min., 14.—On the 3d day, it was 17; on the 4th day, 21; and on the 13th day, 14.	*With atropia*, none. *After physostigma*, none. There was no defæcation, urination, nor salivation during the 1 hour 30 min. of continuous observation.	*With atropia*, in 5 min., restless movements. *After physostigma*, in 3 min., slight fibrillary twitches, which ceased in 1 hour 5 min. In 17 min., slight paralysis; in 55 min., very decided paralysis; and in 1 hour 30 min., decided paralysis. Occasionally, there were some tremors and starts.
b	3 lbs. 5 oz.	0	0	0·135 (= 0·12 gr. p. 3 lbs.)	—	Death, in 26 min.	—	—	—	—	—

Number of Experiment.	Weight of Rabbit.	Doses of Sulphate of Atropia (in Grains). Actual Dose.	Doses of Sulphate of Atropia (in Grains). Dose p. 3 lbs. of Animal.	Dose of Physostigma (in Grains). Actual Dose of Sul. of Physostigmia.	Interval of Time (in minutes.)	Result.	Effect on the Pupils. (The Measurements are in fiftieths of an inch.)	Effect on the Heart.	Effect on the Respirations.	Effect on Secretion and Excretion.	Effects on Motility, &c.
309. *a* [Experiment *b* was performed ten days after experiment *a*.]	3 lbs.	3	3	0·18	90	Recovery.	*With atropia*, in 2 min., dilatation from $\frac{15}{50} \times \frac{15}{50}$ to $\frac{40}{50} \times \frac{40}{50}$. In 89 min., the size was $\frac{15}{50} \times \frac{15}{50}$. *After physostigma*, the size was in 17 min., $\frac{40}{50} \times \frac{40}{50}$; and in 1 hour 15 min., $\frac{15}{50} \times \frac{15}{50}$.—On the following day, it was $\frac{18}{50} \times \frac{18}{50}$; on the 9th day, $\frac{17}{50} \times \frac{17}{50}$; and on the 11th day, $\frac{15}{50} \times \frac{15}{50}$.	*With atropia*, in 5 min., acceleration from 39 to 60 per 10 sec. In 88 min., the rate was 61 per 10 sec. *After physostigma*, the rate per 10 sec. was in 5 min., 60; in 13 min., 43; in 27 min., 41; and in 1 hour 20 min., 42.—On the following day, it was 37; and on the 9th day, 41.	*With atropia*, in 74 min., acceleration from 18 to 19 per 10 sec. *After physostigma*, the rate per 10 sec. was in 9 min., 13; in 25 min., 12; in 35 min., 12; and in 1 hour 16 min., 17.—On the following day, it was 12; and on the 9th day, 11.	*With atropia*, none. *After physostigma*, none. There was no defæcation, urination, nor salivation during the 1 hour 20 min. of continuous observation.	*With atropia*, in 4 min., restlessness, which had ceased by 65 min. *After physostigma*, in 3 min., slight fibrillary twitches, which had ceased, without increasing, by 35 min. In 13 min., slight paralysis; in 35 min., decided paralysis; and in 1 hour 20 min., distinct, though diminished, paralysis. Occasionally, some irregular, doubtfully spasmodic movements occurred.
b	3 lbs.	0	0	0·12	—	Death, in 18 min.	—	—	—	—	—
310. *a* [Experiment *b* was performed thirteen days after experiment *a*.]	3 lbs. 4 oz.	3·25	3	0·195	95	Recovery.	*With atropia*, in 85 min., dilatation from $\frac{10}{50} \times \frac{10}{50}$ to $\frac{17}{50} \times \frac{17}{50}$. *After physostigma*, the size was in 5 min., $\frac{17}{50} \times \frac{17}{50}$; in 40 min., $\frac{18}{50} \times \frac{18}{50}$; and in 1 hour 50 min., $\frac{17}{50} \times \frac{17}{50}$.—On the following day, it was $\frac{18}{50} \times \frac{18}{50}$; on the 6th day, $\frac{19}{50} \times \frac{19}{50}$; and on the 14th day, $\frac{17}{50} \times \frac{17}{50}$.	*With atropia*, in 5 min., acceleration from 41 to 60 per 10 sec. In 85 min., the rate was 58 per 10 sec. *After physostigma*, the rate per 10 sec. was in 4 min., 52; in 22 min., 42; and in 1 hour 50 min., 42.—On the following day, it was 37; on the 3d day, 42; and on the 14th day, 39.	*With atropia*, in 6 min., slowing from 37 to 21 per 10 sec., and in 86 min., to 16. *After physostigma*, the rate per 10 sec. was in 2 min., 13; in 40 min., 14; in 1 hour 15 min., 12; and in 1 hour 51 min., 12.—On the following day, it was 18; and on the 14th day, 24.	*With atropia*, in 9 min., and in 65 min., several fæcel pellets were passed. *After physostigma*, none. There was no defæcation, urination, nor salivation during the 2 hours of continuous observation.	*With atropia*, restlessness was caused, which had disappeared by 60 min. *After physostigma*, in 1 min. 30 sec., rare fibrillary twitches, which had ceased, without increasing, by 1 hour 14 min. In 20 min., distinct paralysis; in 40 min., very decided paralysis; and in 1 hour 50 min., distinct, though lessened, paralysis. Occasionally, there were some feeble tremors and irregular movements.
b	3 lbs. 5 oz.	0	0	0·13 (= about 0·12 gr. p. 3 lbs.)	—	Death, in 28 min.	—	—	—	—	—

Number of Experiment.	Weight of Rabbit.	Doses of Sulphate of Atropia (in Grains). Actual Dose.	Doses of Sulphate of Atropia (in Grains). Dose p. 3 lbs. of Animal.	Dose of Physostigma (in Grains). Actual Dose of Sul. of Physostigmia.	Interval of Time (in minutes).	Result.	Effect on the Pupils. (The Measurements are in fiftieths of an inch.)	Effect on the Heart.	Effect on the Respirations.	Effect on Secretion and Excretion.	Effects on Motility, &c.
311.	3 lbs. 2 oz.	3·17	3	0·187	100	Death, in 57 min. after the administration of physostigma.	*With atropia*, in 7 min., dilatation from $\frac{14}{50} \times \frac{13}{50}$ to $\frac{18}{50} \times \frac{18}{50}$. In 98 min., the size was $\frac{18}{50} \times \frac{18}{50}$. *After physostigma*, the size was in 5 min., $\frac{15}{50} \times \frac{13}{50}$; in 13 min., $\frac{12}{50} \times \frac{12}{50}$; in 50 min., $\frac{10}{50} \times \frac{9}{50}$; and in 47 min., $\frac{13}{50} \times \frac{13}{50}$.—After death, it was in 6 min., $\frac{9}{50} \times \frac{9}{50}$; and in 1 hour 8 min., $\frac{10}{50} \times \frac{10}{50}$.	*With atropia*, in 5 min., acceleration from 38 to 60 per 10 sec. In 99 min., the rate per 10 sec. was 61. *After physostigma*, the rate per 10 sec. was in 4 min., 52; in 10 min., 31; in 41 min., 25; and in 43 min., 8.	*With atropia*, in 23 min., slowing to 15 per 10 sec.; and in 98 min. return to the normal rate of 22 per 10 sec. *After physostigma*, the rate per 10 sec. was in 5 min., 19; in 34 min., 13; and in 42 min., 10. Afterwards, only feeble gasps occurred irregularly until death.	*With atropia*, in 23 min., and in 35 min., several fæcal pellets were passed. There was no urination. *After physostigma*, in 14 min., in 39 min., and in 41 min., fæcal pellets were passed. In 14 min., and in 41 min., urine was freely voided. In 26 min., salivation commenced.	*With atropia*, in 34 min., restlessness, which had ceased by 30 min. *After physostigma*, in 1 min. 30 sec., rare fibrillary twitches, which soon became well marked, and continued for several min. after death. In 10 min., slight paralysis; and in 52 min., general flaccidity. Frequently, there were tremors, and now and then some convulsive movements.—Rigor began to set in at 1 hour 8 min. after death (temp. of laboratory, 58° F.).
312.	3 lbs. 12 oz.	3·75	3	0·22	105	Death, in 37 min. after the administration of physostigma.	*With atropia*, in 3 min., dilatation from $\frac{13}{50} \times \frac{12}{50}$ to $\frac{18}{50} \times \frac{18}{50}$. In 103 min., the size was $\frac{18}{50} \times \frac{18}{50}$. *After physostigma*, the size was in 10 min., $\frac{18}{50} \times \frac{18}{50}$; in 28 min., $\frac{12}{50} \times \frac{10}{50}$; and in 37 min., $\frac{10}{50} \times \frac{10}{50}$.—After death, it was in 2 min., $\frac{13}{50} \times \frac{12}{50}$; and in 35 min., $\frac{15}{50} \times \frac{15}{50}$.	*With atropia*, in 9 min., acceleration from 40 to 60 per 10 sec. In 104 min., the rate was 59 per 10 sec. *After physostigma*, the rate per 10 sec. was in 5 min., 44; in 19 min., 43; in 21 min., 29; in 28 min., 22; and in 32 min., 20. Afterwards, the impulse was so feeble that the rate could not be ascertained.	*With atropia*, in 75 min., acceleration from 16 to 37 per 10 sec. In 104 min., the rate was 38 per 10 sec. *After physostigma*, the rate per 10 sec. was in 4 min., 38; in 11 min., 18; in 14 min., 15; and in 20 min., 6. Afterwards, only feeble gasps occurred; in 24 min., 5; in 27 min., 2; and in 35 min., 1, per 10 sec.	*With atropia*, in 35 min., a large quantity of pultaceous fæces was passed. *After physostigma*, in 14 min., salivation commenced, but it did not become profuse. There was neither defæcation nor urination.	*With physostigma*, in 6 min., restlessness, which had ceased by 80 min. *After physostigma*, in 2 min., rare fibrillary twitches, which had ceased without increasing by 22 min. In 8 min., slight paralysis; and in 20 min., general flaccidity. Occasionally, there were some irregular movements of a doubtfully convulsive nature.—There was no appearance of rigor at 35 min. after death (temp. of laboratory, 58° F.).
313.	3 lbs. 1 oz.	3·06	3	0·183	120	Death, in 54 min. after the administration of physostigma.	*With atropia*, in 4 min., dilatation from $\frac{14}{50} \times \frac{13}{50}$ to $\frac{16}{50} \times \frac{16}{50}$. In 114 min., the size was $\frac{16}{50} \times \frac{16}{50}$. *After physostigma*, the size was in 5 min., $\frac{16}{50} \times \frac{16}{50}$; in 30 min., $\frac{15}{50} \times \frac{14}{50}$; and in 53 min., $\frac{15}{50} \times \frac{15}{50}$.—After death, it was in 1 min., $\frac{17}{50} \times \frac{17}{50}$; in 4 min., $\frac{14}{50} \times \frac{14}{50}$; in 14 min., $\frac{10}{50} \times \frac{10}{50}$; and in 46 min., $\frac{13}{50} \times \frac{13}{50}$.	*With atropia*, in 8 min., acceleration from 40 to 62 per 10 sec.. In 113 min., the rate was 63 per 10 sec. *After physostigma*, the rate per 10 sec. was in 5 min., 56; in 12 min., 48; in 26 min., 45; in 36 min., 25; in 47 min., 17; and in 51 min., 15. Afterwards, the impulse was so feeble that the rate could not be ascertained.	*With atropia*, in 2 min., acceleration from 19 to 20 per 10 sec. In 116 min., the rate was 23 per 10 sec. *After physostigma*, the rate per 10 sec. was in 3 min., 25; in 22 min., 15; in 36 min., 11; and in 46 min., 4. Afterwards, only gasps occurred, the rate per 10 sec. of which was in 50 min., 3; and in 53 min., 2.	*With atropia*, in 16 min., urine was freely voided. There was no defæcation. *After physostigma*, in 30 min., salivation commenced, and by-and-by became profuse. There was neither defæcation nor urination.	*With atropia*, in 8 min., restlessness, which had ceased by 40 min. *After physostigma*, in 2 min., rare fibrillary twitches, which became well marked, but ceased before death. In 7 min., slight paralysis; and in 45 min., general flaccidity. Tremors occurred frequently, and now and then there were some feeble spasms.—Rigor began to set in at about 46 min. after death.

Number of Experiment.	Weight of Rabbit.	Doses of Sulphate of Atropia (in Grains). Actual Dose.	Doses of Sulphate of Atropia (in Grains). Dose p. 3 lbs. of Animal.	Dose of Physostigma (in Grains). Actual Dose of Sul. of Physostigmia.	Interval of Time (in minutes).	Result.	Effect on the Pupils. (The Measurements are in fiftieths of an inch.)	Effect on the Heart.	Effect on the Respirations.	Effect on Secretion and Excretion.	Effects on Motility, &c.
314.	3 lbs.	4·5	4·5	0·18	10	Death, in 41 min. after the administration of physostigma.	*With atropia*, in 3 min., dilatation from $\frac{13}{50} \times \frac{11}{50}$ to $\frac{15}{50} \times \frac{15}{50}$; and in 7 min., to $\frac{18}{50} \times \frac{18}{50}$. *After physostigma*, the size was in 4 min., $\frac{16}{50} \times \frac{16}{50}$; in 20 min., $\frac{17}{50} \times \frac{17}{50}$; and in 40 min., $\frac{17}{50} \times \frac{17}{50}$.—After death, it was in 1 min., $\frac{16}{50} \times \frac{16}{50}$; in 31 min., $\frac{16}{50} \times \frac{9}{50}$; and in 1 hour 10 min., $\frac{11}{50} \times \frac{11}{50}$.	*With atropia*, in 9 min., acceleration from 40 to 60 per 10 sec. *After physostigma*, the rate per 10 sec. was in 4 min., 60; in 18 min., 58; in 25 min., 48; and in 31 min., 39.	*With atropia*, in 9 min. 30 sec., acceleration from 24 to 27 per 10 sec. *After physostigma*, the rate per 10 sec. was in 13 min., 23; in 20 min., 8; in 23 min., 7; and in 25 min., 5. Afterwards, only feeble gasps occurred irregularly.	*With atropia*, none. *After physostigma*, in 9 min., urine was freely voided. There was neither defæcation nor salivation.	*With atropia*, restless movements. *After physostigma*, in 1 min. 30 sec., rare fibrillary twitches, which soon became pretty well marked, but had ceased by 27 min. In 7 min., slight paralysis; and in 20 min., general flaccidity. Now and then, some feeble and somewhat spasmodic movements occurred.—Rigor began to set in at about 1 hour 11 min. after death (temp. of laboratory, 55° F.).
315. *a* [Experiment *b* was performed fifteen days after experiment *a*.]	3 lbs.	4·5	4·5	0·18	15	Recovery.	*With atropia*, in 4 min., dilatation from $\frac{13}{50} \times \frac{11}{50}$ to $\frac{16}{50} \times \frac{16}{50}$; and in 14 min., to $\frac{17}{50} \times \frac{17}{50}$. *After physostigma*, the size was in 5 min., $\frac{17}{50} \times \frac{17}{50}$; and in 1 hour 13 min., $\frac{17}{50} \times \frac{17}{50}$.—On the following day, it was $\frac{17}{50} \times \frac{17}{50}$; on the 9th day, $\frac{15}{50} \times \frac{15}{50}$; and on the 16th day, $\frac{14}{50} \times \frac{13}{50}$.	*With atropia*, in 5 min., acceleration from 38 to 54 per 10 sec. In 13 min., the rate was 59 per 10 sec. *After physostigma*, the rate per 10 sec. was in 13 min., 53; and in 1 hour 20 min., 50.—On the following day, it was 33; on the 3d day, 43; and on the 16th day, 40.	*With atropia*, in 13 min., acceleration from 19 to 25 per 10 sec. *After physostigma*, the rate per 10 sec. was in 5 min., 18; in 52 min., 11; and in 1 hour 21 min., 16.—On the following day, it was 15; and on the 16th day, 14.	*With atropia*, none. *After physostigma*, none. There was no defæcation, urination, nor salivation during the 1 hour 30 min. of continuous observation.	*With atropia*, restless movements. *After physostigma*, in 1 min. 30 sec., rare fibrillary twitches, which became well marked, and continued for more than 1 hour 20 min. In 10 min., slight paralysis; in 17 min., very decided paralysis; and in 1 hour 30 min., only slight paralysis. Occasionally, there were some sudden starts, chiefly of the head.
	b 3 lbs.	0	0	0·12	—	Death, in 19 min.	—	—	—	—	—
316. *a* [Experiment *b* was performed nine days after experiment *a*.]	3 lbs. 4 oz.	4·87	4·5	0·19	15	Recovery.	*With atropia*, in 2 min., dilatation from $\frac{13}{50} \times \frac{13}{50}$ to $\frac{15}{50} \times \frac{15}{50}$. In 14 min., the size was $\frac{15}{50} \times \frac{15}{50}$. *After physostigma*, the size was in 5 min., $\frac{15}{50} \times \frac{15}{50}$; in 1 hour, $\frac{15}{50} \times \frac{15}{50}$; and in 3 hours 45 min., $\frac{16}{50} \times \frac{17}{50}$.—On the following day, it was $\frac{15}{50} \times \frac{13}{50}$; on the 8th day, $\frac{13}{50} \times \frac{13}{50}$; and on the 10th day, $\frac{12}{50} \times \frac{9}{50}$.	*With atropia*, in 3 min., acceleration from 38 to 52 per 10 sec.; and in 14 min., to 59. *After physostigma*, the rate per 10 sec. was in 10 min., 63; in 40 min., 59; in 1 hour 37 min., 52; and in 3 hours 30 min., 39.—On the following day, it was 28; on the 3d day, 44; and on the 10th day, 39.	*With atropia*, none. The original rate was 20 per 10 sec. *After physostigma*, the rate per 10 sec. was in 4 min., 14; in 15 min., 22; in 1 hour 20 min., 12; in 1 hour 40 min., 10; and in 3 hours 52 min., 11.—On the following day, it was 10; and on the 10th day, 20.	*With atropia*, none. *After physostigma*, none. There was no defæcation, urination, nor salivation during the 3 hours 50 min. of continuous observation.	*With atropia*, restless movements. *After physostigma*, in 2 min., rare fibrillary twitches, which had ceased by 40 min. In 14 min., slight paralysis; in 50 min., very decided paralysis; and in 3 hours 30 min., only slight paralysis. Tremors occurred frequently.
	b 3 lbs. 5 oz.	0	0	0·135 (= 0·12 gr. p. 3 lbs.)	—	Death, in 21 min.	—	—	—	—	—

Number of Experiment.	Weight of Rabbit.	Doses of Sulphate of Atropia (in Grains). Actual Dose.	Doses of Sulphate of Atropia (in Grains). Dose p. 3 lbs. of Animal.	Dose of Physostigma (in Grains). Actual Dose of Sul. of Physostigmia.	Interval of Time (in minutes).	Result.	Effect on the Pupils. (The Measurements are in fiftieths of an inch.)	Effect on the Heart.	Effect on the Respirations.	Effect on Secretion and Excretion.	Effects on Motility, &c.
317. [Experiment *b* was performed eight days after experiment *a*.]	3 lbs.	4·5	4·5	0·18	20	Recovery.	*With atropia*, in 3 min., dilatation from $\frac{14}{50} \times \frac{13}{50}$ to $\frac{16}{50} \times \frac{16}{50}$; and in 6 min., to $\frac{17}{50} \times \frac{17}{50}$. *After physostigma*, the size was in 7 min., $\frac{17}{50} \times \frac{17}{50}$; and in 2 hours, $\frac{17}{50} \times \frac{14}{50}$.—On the following day, it was $\frac{13}{50} \times \frac{13}{50}$; and on the 9th day, $\frac{18}{50} \times \frac{18}{50}$.	*With atropia*, in 4 min., acceleration from 35 to 55 per 10 sec.; and in 18 min., to 58 per 10 sec. *After physostigma*, the rate per 10 sec. was in 7 min., 56; in 15 min., 53; in 1 hour, 50; and in 2 hours, 43.—On the following day, it was 39; on the 7th day, 41; and on the 9th day, 38.	*With atropia*, in 17 min., acceleration from 21 to 24 per 10 sec. *After physostigma*, the rate per 10 sec. was in 5 min., 16; in 1 hour 2 min., 18; and in 1 hour 51 min., 23.—On the following day, it was 19; and on the 9th day, 19.	*With atropia*, in 18 min., several fæcal pellets were passed. *After physostigma*, none. There was no defæcation, urination, nor salivation during the 2 hours of continuous observation.	*With atropia*, restless movements. *After physostigma*, in 4 min. very rare fibrillary twitches, which had ceased, without increasing, by 17 min. In 15 min., slight paralysis; in 1 hour, very decided paralysis; and in 2 hours, decided, though lessened, paralysis. Occasionally, there were some feeble tremors.
	b 3 lbs. 3 oz.	0	0	0·125 (= 0·12 gr. p. 3 lbs.)	—	Death, in 20 min.	—	—	—	—	—
318.	3 lbs. 1 oz.	5·1	5	0·18	15	Death, in 30 min. after the administration of physostigma.	*With atropia*, in 13 min., dilatation from $\frac{14}{50} \times \frac{13}{50}$ to $\frac{17}{50} \times \frac{17}{50}$. *After physostigma*, the size was in 7 min., $\frac{17}{50} \times \frac{17}{50}$; in 20 min., $\frac{18}{50} \times \frac{18}{50}$; and in 30 min., $\frac{19}{50} \times \frac{19}{50}$.—After death, it was in 2 min., $\frac{14}{50} \times \frac{14}{50}$; in 7 min., $\frac{19}{50} \times \frac{19}{50}$; and in 52 min., $\frac{17}{50} \times \frac{17}{50}$.	*With atropia*, in 14 min., acceleration from 43 to 63 per 10 sec. *After physostigma*, the rate per 10 sec. was in 3 min., 63; in 5 min., 56; in 22 min., 45; and in 29 min., 30.	*With atropia*, in 13 min., acceleration from 22 to 26 per 10 sec. *After physostigma*, the rate per 10 sec. was in 4 min., 17; in 17 min., 11; and in 20 min., 4. Afterwards, only feeble gasps occurred irregularly.	*With atropia*, none. *After physostigma*, none. There was no defæcation, urination, nor salivation.	*With atropia*, restlessness. *After physostigma*, in 1 min. 30 sec., rare fibrillary twitches, which ceased in a few minutes. In 9 min., distinct paralysis; and in 19 min., general flaccidity. Tremors and feeble spasms frequently occurred.—There was no appearance of rigor at 52 min. after death (temp. of laboratory, 60° F.).
319.	3 lbs. 10 oz.	6	5	0·217	20	Death, in 45 min. after the administration of physostigma.	*With atropia*, in 18 min., dilatation from $\frac{15}{50} \times \frac{14}{50}$ to $\frac{19}{50} \times \frac{19}{50}$. *After physostigma*, the size was in 9 min., $\frac{19}{50} \times \frac{19}{50}$; and in 44 min., $\frac{19}{50} \times \frac{19}{50}$.—After death, it was in 2 min., $\frac{15}{50} \times \frac{15}{50}$; and in 25 min., $\frac{18}{50} \times \frac{18}{50}$.	*With atropia*, in 8 min., acceleration from 40 to 63 per 10 sec. In 19 min., the rate was 61 per 10 sec. *After physostigma*, the rate per 10 sec. was in 4 min., 57; in 9 min., 50; in 30 min., 42; in 36 min., 39; and in 44 min. 30 sec., 26.	*With atropia*, in 18 min., acceleration from 30 to 34 per 10 sec. *After physostigma*, the rate per 10 sec. was in 18 min., 19; in 23 min., 11; in 25 min., 4; in 30 min., 7; and in 33 min., 1. Afterwards, only extremely feeble and rare respiratory movements occurred.	*With atropia*, several fæcal pellets were passed. *After physostigma*, none. There was no defæcation, urination, nor salivation.	*With atropia*, restlessness. *After physostigma*, in 2 min., rare fibrillary twitches, which had ceased by 27 min. In 15 min., distinct paralysis; in 20 min., very decided paralysis; and in 27 min., general flaccidity. Tremors and weak spasms occurred frequently.—There was no appearance of rigor at 25 min. after death.

Number of Experiment.	Weight of Rabbit.	Doses of Sulphate of Atropia (in Grains). Actual Dose.	Doses of Sulphate of Atropia (in Grains). Dose p. 3 lbs. of Animal.	Dose of Physostigma (in Grains). Actual Dose of Sul. of Physostigma.	Interval of Time (in minutes).	Result.	Effect on the Pupils. (The Measurements are in fiftieths of an inch.)	Effect on the Heart.	Effect on the Respirations.	Effect on Secretion and Excretion.	Effects on Motility, &c.
320. *a* [Experiment *b* was performed sixteen days after experiment *a*.]	3 lbs. 4 oz.	5·41	5	0·195	25	Recovery.	*With atropia*, in 10 min., dilatation from $\frac{11}{50} \times \frac{18}{50}$ to $\frac{17}{50} \times \frac{17}{50}$. In 24 min., the size was $\frac{17}{50} \times \frac{17}{50}$. *After physostigma*, the size was in 10 min., $\frac{17}{50} \times \frac{17}{50}$; and in 1 hour 30 min., $\frac{18}{50} \times \frac{18}{50}$.—On the following day, it was $\frac{18}{50} \times \frac{18}{50}$; on the 4th day, $\frac{18}{50} \times \frac{18}{50}$; and on the 13th day, $\frac{11}{50} \times \frac{18}{50}$.	*With atropia*, in 5 min., acceleration from 44 to 60 per 10 sec. In 20 min., the rate was 61 per 10 sec. *After physostigma*, the rate per 10 sec. was in 9 min., 54; in 1 hour 10 min., 51; and in 1 hour 22 min., 53.—On the following day, it was 47; on the 6th day, 43; and on the 17th day, 40.	*With atropia*, in 17 min., acceleration from 26 to 40 per 10 sec. *After physostigma*, the rate per 10 sec. was in 7 min., 36; in 29 min., 22; in 1 hour, 18; in 1 hour 10 min., 14; and in 1 hour 23 min., 15.—On the following day, it was 29; on the 3d day, 33; and on the 17th day, 18.	*With atropia*, none. *After physostigma*, in 7 min., and in 1 hour 20 min., fæcal pellets were passed. There was neither urination nor salivation during the 1 hour 40 min. of continuous observation.	*With atropia*, restlessness. *After physostigma*, in 7 min., rare fibrillary twitches, which soon became well marked, and continued for more than 1 hour 20 min. In 20 min., slight paralysis; in 30 min., very decided paralysis; and in 1 hour 30 min., decided though diminished paralysis. Frequently, tremors occurred.
	3 lbs. 4 oz.	0	0	0·13 (= 0·12 gr. p. 3 lbs.)	—	Death, in 21 min.	—	—	—	—	—
321. *a* [Experiment *b* was performed twenty-one days after experiment *a*.]	3 lbs.	5	5	0·18	30	Recovery.	*With atropia*, in 5 min., dilatation from $\frac{13}{50} \times \frac{13}{50}$ to $\frac{17}{50} \times \frac{17}{50}$. In 28 min., the size was $\frac{17}{50} \times \frac{17}{50}$. *After physostigma*, the size was in 20 min., $\frac{17}{50} \times \frac{17}{50}$; in 1 hour, $\frac{17}{50} \times \frac{17}{50}$; and in 2 hours 30 min., $\frac{17}{50} \times \frac{17}{50}$.—On the following day, it was $\frac{17}{50} \times \frac{17}{50}$; on the 13th day, $\frac{18}{50} \times \frac{18}{50}$; and on the 22d day, $\frac{15}{50} \times \frac{14}{50}$.	*With atropia*, in 9 min., acceleration from 42 to 61 per 10 sec. In 29 min., the rate was 61 per 10 sec. *After physostigma*, the rate per 10 sec. was in 6 min., 54; in 50 min., 50; in 2 hours, 51; and in 2 hours 26 min., 53.—On the following day, it was 48; on the 6th day, 46; and on the 22d day, 41.	*With atropia*, in 28 min., slowing from 23 to 18 per 10 sec. *After physostigma*, the rate per 10 sec. was in 15 min, 14; in 1 hour 10 min., 13; and in 2 hours 25 min., 14.—On the following day, it was 23; on the 10th day, 30; and on the 22d day, 14.	*With atropia*, in 7 min., several normal fæcal pellets were passed. *After physostigma*, in 30 min., several normal fæcal pellets were passed. There was neither urination nor salivation during the 2 hours 30 min. of continuous observation.	*With atropia*, restlessness. *After physostigma*, in 6 min., rare fibrillary twitches, which had ceased by 20 min. In 27 min., slight paralysis; in 40 min., decided paralysis; and in 2 hours 30 min., only slight paralysis. Occasionally, there were some feeble tremors.
	3 lbs.	0	0	0·12	—	Death, in 25 min.	—	—	—	—	—
322. *a* [Experiment *b* was performed ten days after experiment *a*.]	3 lbs. 8 oz.	5·83	5	0·21	65	Recovery.	*With atropia*, in 62 min., dilatation from $\frac{13}{50} \times \frac{9}{50}$ to $\frac{15}{50} \times \frac{18}{50}$. *After physostigma*, the size was in 6 min., $\frac{15}{50} \times \frac{15}{50}$; and in 2 hours 10 min., $\frac{11}{50} \times \frac{11}{50}$.—On the 3d day, it was $\frac{11}{50} \times \frac{13}{50}$; and on the 11th day, $\frac{13}{50} \times \frac{13}{50}$.	*With atropia*, in 63 min., acceleration from 41 to 60 per 10 sec. *After physostigma*, the rate per 10 sec. was in 22 min., 58; in 1 hour 5 min., 50; and in 2 hours, 40.—On the 3d day, it was 31; and on the 11th day, 43.	*With atropia*, none. The original rate was 18 per 10 sec. *After physostigma*, the rate per 10 sec. was in 35 min., 18; in 1 hour, 14; and in 2 hours 5 min., 16.—On the 3d day, it was 16; and on the 11th day, 19.	*With atropia*, none. *After physostigma*, in 2 hours 5 min., several normal fæcal pellets were passed. There was neither urination nor salivation during the 2 hours 10 min. of continuous observation.	*With atropia*, restlessness, which had ceased by 35 min. *After physostigma*, in 19 min., pretty well marked fibrillary twitches, which continued for more than 2 hours. In 16 min., slight paralysis; in 40 min., very decided paralysis; and in 2 hours, only slight paralysis. Occasionally, there were tremors and spasms.
	3 lbs. 9 oz.	0	0	0·14 (= about 0·12 gr. p. 3 lbs.)	—	Death, in 37 min.	—	—	—	—	—

Number of Experiment.	Weight of Rabbit.	Doses of Sulphate of Atropia (in Grains). Actual Dose.	Doses of Sulphate of Atropia (in Grains). Dose p. 3 lbs. of Animal.	Dose of Physostigma (in Grains). Actual Dose of Sul. of Physostigmia.	Interval of Time (in minutes).	Result.	Effect on the Pupils. (The Measurements are in fiftieths of an inch.)	Effect on the Heart.	Effect on the Respirations.	Effect on Secretion and Excretion.	Effects on Motility, &c.
323.	3 lbs. 2 oz.	5·2	5	0·19	65	Death, in 1 hour 10 min. after the administration of physostigma.	*With atropia*, in 62 min., dilatation from $\frac{14}{50} \times \frac{13}{50}$ to $\frac{17}{50} \times \frac{17}{50}$. *After physostigma*, the size was in 18 min., $\frac{13}{50} \times \frac{13}{50}$.	*With atropia*, in 15 min., acceleration from 39 to 60 per 10 sec. In 63 min., the rate was 59 per 10 sec. *After physostigma*, the rate per 10 sec. was in 10 min., 58; in 20 min., 56; and in 1 hour, 36.	*With atropia*, in 63 min., slowing from 22 to 16 per 10 sec. *After physostigma*, the rate per 10 sec. was in 7 min., 13; and in 1 hour, 3 (gasping).	*With atropia*, none. *After physostigma*, none. There was no defæcation, urination, nor salivation.	*With atropia*, in 4 min., restlessness, which had ceased by 55 min. *After physostigma*, in 16 min., slight paralysis; and in 30 min., general flaccidity. Frequently, there were tremors and spasms.
324.	3 lbs. 2 oz.	5·2	5	0·19	105	Death, in 56 min. after the administration of physostigma.	*With atropia*, in 10 min., dilatation from $\frac{13}{50} \times \frac{13}{50}$ to $\frac{18}{50} \times \frac{18}{50}$. In 104 min., the size was $\frac{18}{50} \times \frac{18}{50}$. *After physostigma*, the size was in 25 min., $\frac{16}{50} \times \frac{16}{50}$.	*With atropia*, in 6 min., acceleration from 42 to 59 per 10 sec. In 103 min., the rate was 56 per 10 sec. *After physostigma*, the rate per 10 sec. was in 6 min., 54; in 12 min., 49; in 43 min., 36; and in 55 min., 31.	*With atropia*, in 104 min., slowing from 23 to 18 per 10 sec. *After physostigma*, none.	*With atropia*, none. *After physostigma*, none.	*With atropia*, slight hypnosis. *After physostigma*, in 1 min. 30 sec., rare fibrillary twitches, which had ceased by 13 min. In 20 min., excited movements; in 22 min., slight paralysis; and in 36 min., general flaccidity. Frequently, there were tremors and general spasms.
325. *a*	3 lbs. 6 oz. [Experiment *b* was performed nine days after experiment *a*.]	5·83	5	0·21	105	Recovery.	*With atropia*, in 3 min., dilatation from $\frac{13}{50} \times \frac{13}{50}$ to $\frac{18}{50} \times \frac{18}{50}$. In 103 min., the size was $\frac{18}{50} \times \frac{16}{50}$. *After physostigma*, the size was in 2 hours 45 min., $\frac{16}{50} \times \frac{16}{50}$.—On the following day, it was $\frac{16}{50} \times \frac{16}{50}$; on the 4th day, $\frac{15}{50} \times \frac{15}{50}$; and on the 10th day, $\frac{14}{50} \times \frac{14}{50}$.	*With atropia*, in 30 min., acceleration from 41 to 60 per 10 sec. In 104 min., the rate was 57 per 10 sec. *After physostigma*, the rate per 10 sec. was in 6 min., 55; in 1 hour 10 min., 60; and in 2 hours 44 min., 44.—On the following day, it was 35; on the 4th day, 42; and on the 10th day, 39.	*With atropia*, in 31 min., slowing from 36 to 30 per 10 sec.; and in 104 min., to 14 per 10 sec. *After physostigma*, the rate per 10 sec. was in 14 min., 15; in 1 hour 15 min., 15; in 2 hours, 17; and in 2 hours 46 min., 18.—On the following day, it was 18; on the 4th day, 31; and on the 10th day, 15.	*With atropia*, none. *After physostigma*, in 2 hours, urine was freely voided. There was neither defæcation nor salivation during the 2 hours 50 min. of continuous observation.	*With atropia*, in 4 min., restlessness, which had ceased by 90 min. *After physostigma*, in 4 min., rare fibrillary twitches, which became well marked, and continued for more than 2 hours 45 min. In 8 min., slight paralysis; in 25 min., very advanced paralysis; and in 2 hours 50 min., only slight paralysis. Occasionally, there were some tremors.
b	3 lbs. 6 oz.	0	0	0·135 (= 0·12 gr. p. 3 lbs.)	—	Death, in 30 min.	—	—	—	—	—

Number of Experiment.	Weight of Rabbit.	Doses of Sulphate of Atropia (in Grains). Actual Dose.	Doses of Sulphate of Atropia (in Grains). Dose p. 3 lbs. of Animal.	Dose of Physostigma (in Grains). Actual Dose of Sul. of Physostigma.	Interval of Time (in minutes).	Result.	Effect on the Pupils. (The Measurements are in fiftieths of an inch.)	Effect on the Heart.	Effect on the Respirations.	Effect on Secretion and Excretion.	Effects on Motility, &c.
326. *a* [Experiment *b* was performed twelve days after experiment *a*.]	3 lbs. 5 oz.	5·52	5	0·2	140	Recovery.	*With atropia*, in 7 min., dilatation from $\frac{14}{50} \times \frac{14}{50}$ to $\frac{16}{50} \times \frac{16}{50}$. In 135 min., the size was $\frac{15}{50} \times \frac{15}{50}$. *After physostigma*, the size was in 5 min., $\frac{15}{50} \times \frac{15}{50}$; in 1 hour, $\frac{15}{50} \times \frac{15}{50}$; and in 1 hour 30 min., $\frac{15}{50} \times \frac{15}{50}$.—On the following day, it was $\frac{17}{50} \times \frac{17}{50}$; on the 3d day, $\frac{17}{50} \times \frac{17}{50}$; and on the 13th day, $\frac{15}{50} \times \frac{14}{50}$.	*With atropia*, in 8 min., acceleration from 42 to 60 per 10 sec. The rate per 10 sec. was in 110 min., 52; and in 136 min., 52. *After physostigma*, the rate per 10 sec. was in 4 min., 48; in 40 min., 47; and in 1 hour 20 min., 49.—On the following day, it was 48; on the 3d day, 46; and on the 13th day, 42.	*With atropia*, in 40 min., slowing from 29 to 19 per 10 sec. In 137 min., the rate was 23 per 10 sec. *After physostigma*, the rate per 10 sec. was in 8 min., 21; in 45 min., 15; and in 1 hour 15 min., 13.—On the following day, it was 30; and on the 13th day, 22.	*With atropia*, none. *After physostigma*, none. There was no defæcation, urination, nor salivation during the 1 hour 30 min. of continuous observation.	*With atropia*, in 7 min., restlessness, which had ceased by 38 min. *After physostigma*, in 5 min. 30 sec., rare fibrillary twitches, which soon became well marked, and continued so for more than 1 hour. In 19 min., distinct paralysis; in 50 min., very advanced paralysis; and in 1 hour 30 min., advanced paralysis. There were neither tremors nor spasms.
b	3 lbs. 4 oz.	0	0	0·13 (= 0·12 gr. p. 3 lbs.)	—	Death, in 24 min.	—	—	—	—	—
327. *a* [Experiment *b* was performed twelve days after experiment *a*.]	3 lbs. 6 oz.	5·62	5	0·2	170	Recovery.	*With atropia*, in 10 min., dilatation from $\frac{12}{50} \times \frac{11}{50}$ to $\frac{17}{50} \times \frac{17}{50}$. In 165 min., the size was $\frac{16}{50} \times \frac{16}{50}$. *After physostigma*, the size was in 1 hour 30 min., $\frac{16}{50} \times \frac{16}{50}$.—On the following day, it was $\frac{17}{50} \times \frac{17}{50}$; and on the 13th day, $\frac{15}{50} \times \frac{15}{50}$.	*With atropia*, in 9 min., acceleration from 41 to 60 per 10 sec. In 166 min., the rate was 60 per 10 sec. *After physostigma*, the rate per 10 sec. was in 8 min., 60; in 12 min., 46; in 50 min., 49; in 1 hour, 46; and in 1 hour 30 min., 43.—On the following day, it was 47; and on the 13th day, 40.	*With atropia*, in 6 min., slowing from 23 to 17 per 10 sec.; and in 165 min., to 15 per 10 sec. *After physostigma*, the rate per 10 sec. was in 10 min., 17; in 40 min., 20; and in 1 hour 29 min., 14.—On the following day, it was 20; and on the 13th day, 19.	*With atropia*, none. *After physostigma*, none. There was no defæcation, urination, nor salivation during the 1 hour 35 min. of continuous observation.	*With atropia*, in 10 min., restlessness, which had ceased by 40 min. *After physostigma*, in 3 min., rare fibrillary twitches, which continued thus for more than 1 hour 30 min. In 12 min., slight paralysis; in 40 min., very decided paralysis; and in 1 hour 30 min., also very decided paralysis. Frequently, there were tremors and irregular spasmodic movements.
b	3 lbs. 5 oz.	0	0	0·13 (= 0·12 gr. p. 3 lbs.)	—	Death, in 21 min.	—	—	—	—	—

Number of Experiment.	Weight of Rabbit.	Doses of Sulphate of Atropia (in Grains). Actual Dose.	Doses of Sulphate of Atropia (in Grains). Dose p. 3 lbs. of Animal.	Dose of Physostigma (in Grains). Actual Dose of Sul. of Physostigmia.	Interval of Time (in minutes).	Result.	Effect on the Pupils. (The Measurements are in fiftieths of an inch.)	Effect on the Heart.	Effect on the Respirations.	Effect on Secretion and Excretion.	Effects on Motility, &c.
328. *a* [Experiment *b* was performed nine days after experiment *a*.]	3 lbs. 11 oz.	6·1	5	0·22	175	Recovery.	*With atropia*, in 4 min., dilatation from $\frac{1}{50} \times \frac{1}{50}$ to $\frac{13}{50} \times \frac{18}{50}$. In 174 min., the size was $\frac{18}{50} \times \frac{18}{50}$. *After physostigma*, the size was in 5 min., $\frac{12}{50} \times \frac{12}{50}$.—The size was not again noted until the following day, when it was $\frac{18}{50} \times \frac{18}{50}$; on the 6th day, it was $\frac{18}{50} \times \frac{18}{50}$; and on the 10th day, $\frac{12}{50} \times \frac{12}{50}$.	*With atropia*, in 4 min. 30 sec., acceleration from 41 to 60 per 10 sec. In 173 min., the rate was 54 per 10 sec. *After physostigma*, the rate per 10 sec. was in 4 min., 50; in 23 min., 54; in 40 min., 37; and in 1 hour 30 min., 33.—On the following day, it was 42; on the 6th day, 40; and on the 10th day, 39.	*With atropia*, in 20 min., slowing from 27 to 24 per 10 sec. In 174 min., the rate was 15 per 10 sec. *After physostigma*, the rate per 10 sec. was in 3 min., 16; in 28 min., 14; in 40 min., 22; and in 1 hour 25 min., 20.	*With atropia*, in 75 min., and in 173 min., fæcal pellets were passed. There was no urination. *After physostigma*, in 5 min., in 49 min., in 1 hour 20 min., and in 1 hour 35 min., several fæcal pellets were passed. In 1 hour 20 min., and in 1 hour 35 min., urine was freely voided. In 50 min., salivation commenced, which continued until after 1 hour 35 min., and was accompanied with noisy respirations.	*With atropia*, no obvious effect. *After physostigma*, in 1 min. 30 sec., rare fibrillary twitches, which soon became well marked, and continued so for more than 1 hour 25 min. In 10 min., slight paralysis; in 45 min., very advanced paralysis; and in 1 hour 35 min., distinct, though diminished paralysis. Occasionally, there were some feeble tremors.
b	3 lbs. 10 oz.	0	0	0·145 (= 0·12 gr. p. 3 lbs.)	—	Death, in 25 min.	—	—	—	—	—
329.	3 lbs.	5	5	0·18	180	Death, in 53 min. after the administration of physostigma.	*With atropia*, in 10 min., dilatation from $\frac{11}{50} \times \frac{10}{50}$ to $\frac{12}{50} \times \frac{10}{50}$. In 177 min., the size was $\frac{15}{50} \times \frac{15}{50}$. *After physostigma*, the size was in 7 min., $\frac{15}{50} \times \frac{15}{50}$; in 45 min., $\frac{17}{50} \times \frac{17}{50}$; and in 52 min., $\frac{17}{50} \times \frac{17}{50}$.—After death, it was in 1 min., $\frac{15}{50} \times \frac{15}{50}$; in 10 min., $\frac{14}{50} \times \frac{14}{50}$; and 53 min., $\frac{15}{50} \times \frac{15}{50}$.	*With atropia*, in 4 min., acceleration from 44 to 60 per 10 sec. In 178 min., the rate was 62 per 10 sec. *After physostigma*, the rate per 10 sec. was in 4 min., 55; in 6 min., 50; in 32 min., 52; in 45 min., 42; in 50 min., 26; and in 52 min., 24.	*With atropia*, in 11 min., acceleration from 27 to 32 per 10 sec. In 177 min., the rate was 15 per 10 sec. *After physostigma*, the rate per 10 sec. was in 8 min., 11; in 28 min., 14; in 34 min., 11; and in 45 min., 5. Afterwards, only laboured gasps occurred.	*With atropia*, none. *After physostigma*, none. There was no defæcation, urination, nor salivation.	*With atropia*, in 10 min., restlessness, which had ceased by 50 min. *After physostigma*, no fibrillary twitches were detected. In 12 min., distinct paralysis; and in 36 min., general flaccidity. Frequently, there were tremors and feeble spasms.—Rigor began to set in at about 50 min. after death (temp. of laboratory, 58° F.).
330.	3 lbs. 10 oz.	6·04	6	0·217	185	Death, in 43 min. after the administration of physostigma.	*With atropia*, in 7 min., dilatation from $\frac{15}{50} \times \frac{14}{50}$ to $\frac{17}{50} \times \frac{17}{50}$. In 180 min., the size was $\frac{15}{50} \times \frac{15}{50}$. *After physostigma*, the size was in 6 min., $\frac{15}{50} \times \frac{15}{50}$; in 34 min., $\frac{15}{50} \times \frac{15}{50}$; in 57 min., $\frac{13}{50} \times \frac{13}{50}$; and in 42 min., $\frac{10}{50} \times \frac{10}{50}$.—After death, it was in 2 min., $\frac{13}{50} \times \frac{13}{50}$; in 7 min., $\frac{15}{50} \times \frac{15}{50}$; and in 47 min., $\frac{15}{50} \times \frac{15}{50}$.	*With atropia*, in 25 min., acceleration from 36 to 62 per 10 sec. In 183 min., the rate was 57 per 10 sec. *After physostigma*, the rate per 10 sec. was in 5 min., 49; in 9 min., 43; in 20 min., 41; and in 30 min., 25. The impulse could not be felt after 34 min. With the stethescope, in 35 min., the rate was found to be 18 per 10 sec.	*With atropia*, in 7 min., slowing from 21 to 16 per 10 sec. In 181 min., the rate was 13 per 10 sec. *After physostigma*, the rate per 10 sec. was in 8 min., 18; in 28 min., 10; and in 32 min., 8. Afterwards, only feeble and noisy gasps occurred.	*With atropia*, none. *After physostigma*, in 25 min., salivation commenced, and the respirations became noisy. There was neither defæcation nor urination.	*With atropia*, restlessness. *After physostigma*, in 3 min., rare fibrillary twitches, which soon became well marked, and continued for several min. after death. In 13 min., slight paralysis; and in 32 min., general flaccidity. Tremors occured frequently.—There was no appearance of rigor at 47 min. after death (temp. of laboratory, 58° F.).

Number of Experiment.	Weight of Rabbit.	Doses of Sulphate of Atropia (in Grains).		Dose of Physostigma (in Grains).	Interval of Time (in minutes).	Result.	Effect on the Pupils. (The Measurements are in fiftieths of an inch.)	Effect on the Heart.	Effect on the Respirations.	Effect on Secretion and Excretion.	Effects on Motility, &c.
		Actual Dose.	Dose p. 3 lbs. of Animal.	Actual Dose of Sul. of Physostigmia.							
331.	3 lbs. 4 oz.	5·41	5	0·195	200	Death, in 1 hour 6 min. after the administration of physostigma.	*With atropia*, in 4 min., dilatation from $\frac{12}{50} \times \frac{11}{50}$ to $\frac{17}{50} \times \frac{17}{50}$. In 195 min., the size was $\frac{17}{50} \times \frac{17}{50}$. *After physostigma*, the size was in 30 min., $\frac{17}{50} \times \frac{17}{50}$; in 45 min., $\frac{17}{50} \times \frac{17}{50}$; and in 1 hour 5 min., $\frac{17}{50} \times \frac{17}{50}$.—After death, it was in 2 min., $\frac{14}{50} \times \frac{14}{50}$; in 3 min., $\frac{14}{50} \times \frac{14}{50}$; and in 14 min., $\frac{12}{50} \times \frac{12}{50}$.	*With atropia*, in 4 min. 30 sec., acceleration from 39 to 57 per 10 sec. In 198 min., the rate was 52 per 10 sec. *After physostigma*, the rate per 10 sec. was in 5 min., 51; in 14 min., 40; in 25 min., 39; in 35 min., 36; in 45 min., 30; in 55 min., 23; and in 1 hour 3 min. 30 sec., 16 (very feeble).	*With atropia*, in 8 min., acceleration from 27 to 38 per 10 sec. In 197 min., the rate was 16 per 10 sec. *After physostigma*, the rate per 10 sec. was in 5 min., 15; in 25 min., 11; in 46 min., 10 (noisy); and in 1 hour 3 min., 8. Afterwards, only gasps occurred.	*With atropia*, none. *After physostigma*, in 16 min., in 32 min., and in 51 min., urine was voided. In 51 min., and in 1 hour 3 min., semi-liquid fæces were passed. In 25 min., salivation commenced and continued until death.	*With atropia*, in 4 min., restlessness, which had ceased by 50 min. *After physostigma*, in 5 min., rare fibrillary twitches, which became well marked, and continued for several minutes after death. In 8 min., slight paralysis; and in 25 min., general flaccidity. There were neither tremors nor spasms.—There was no appearance of rigor at 14 min. after death (temp. of laboratory, 55° F.).

EXPLANATION OF PLATES XXIII., XXIV., AND XXV.

In each of the diagrams represented in these plates, the experiments that terminated in recovery are marked by dots, and those that terminated in death by crosses; and a line (distinguished in several of the diagrams as *a b c*) has been drawn so as to separate the dots from the crosses. The area on the side of the line where the dots occur has been coloured pink, while the area on the side where the crosses occur has been coloured blue; and, accordingly, the pink area represents the region of recovery, and the blue area the region of death. In the diagrams of Plates XXIII. and XXIV., the red horizontal line indicates the position of the minimum-lethal dose of physostigma.

Plate XXIII.

Diagram 1 illustrates the first series of experiments, in which atropia in varying doses was administered five minutes *before* varying doses of physostigma.

Diagram 2 illustrates the small portion of the first series that extends to ·2 gr. of sulphate of atropia. It is drawn on a different scale from Diagram 1, as each tenth of a grain of sulphate of atropia is indicated by twenty in place of by two subdivisions of the horizontal lines.

Diagram 3 illustrates the second series of experiments, in which atropia in varying doses was administered five minutes *after* varying doses of physostigma.

Diagram 4 illustrates the small portion of the second series of experiments that extends to ·2 gr. of sulphate of atropia; and the scale on which it has been drawn differs from that of Diagram 3 to the same extent as the scale of Diagram 2 differs from that of Diagram 1.

Diagrams 1 and 3 are mainly designed to illustrate the experiments extending from the minimum-lethal dose of physostigma to the largest dose that can be counteracted successfully by atropia. They have been drawn on the same scale in order that the results of the two series of experiments represented by them may be compared. Diagrams 2 and 4 exhibit the course of the line *a b* in the first and second series of experiments respectively, with greater distinctness and accuracy than Diagrams 1 and 3.

Plate XXIV.

Diagram 5 illustrates the first series of experiments; but it differs from Diagrams 1 and 2 in so far that the entire region of recovery (pink) is represented, and that each subdivision of the horizontal lines indicates a tenth in place of a twentieth of a grain of sulphate of atropia. The perpendicular red line marks the position of the minimum-lethal dose of sulphate of atropia.

The main purpose of this diagram is to show what combinations of atropia with less than the minimum-lethal dose of physostigma are able to produce death. These combinations are represented in the blue region below the red horizontal line.

Plate XXV.

Diagram 6 illustrates the third series of experiments, in which the dose of physostigma was constant (one and a half times the minimum-lethal dose), while the dose of atropia and the interval of time varied. In this diagram, as in Diagrams 1 and 3, each subdivision of the horizontal lines represents one-twentieth of a grain of sulphate of atropia. The intervals of time are represented by distance in a perpendicular direction from the thick horizontal line, which indicates the zero interval or simultaneous administration; and points below this line indicate atropia administered *after* physostigma, while points above it indicate atropia administered *before* physostigma.

DIAGRAM 1. ILLUSTRATING THE 1ST SERIES OF EXPERIMENTS IN WHICH ATROPIA WAS ADMINISTERED FIVE MINUTES BEFORE PHYSOSTIGMA.

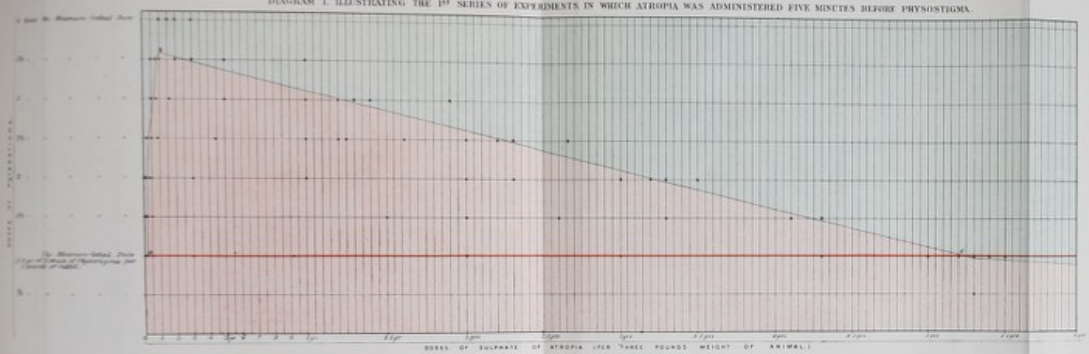


DIAGRAM 2. ILLUSTRATING THE 1ST SERIES OF EXPERIMENTS.

DIAGRAM 3. ILLUSTRATING THE 2ND SERIES OF EXPERIMENTS IN WHICH ATROPIA WAS ADMINISTERED FIVE MINUTES AFTER PHYSOSTIGMA.

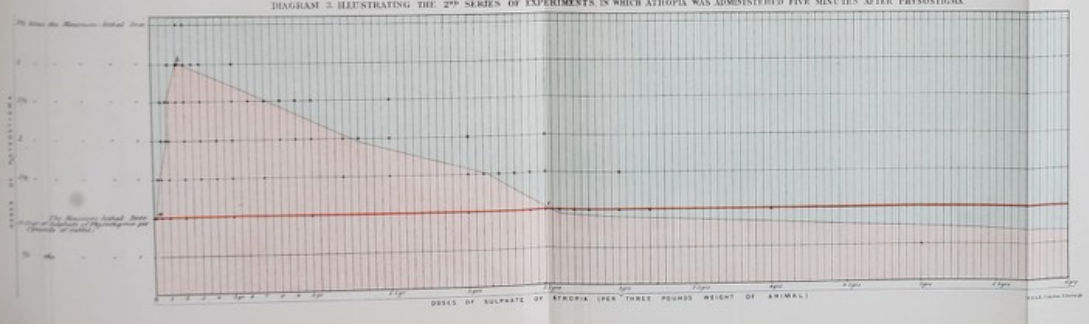


DIAGRAM 4. ILLUSTRATING THE 2ND SERIES OF EXPERIMENTS.

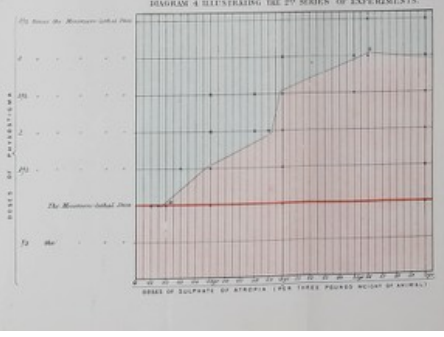
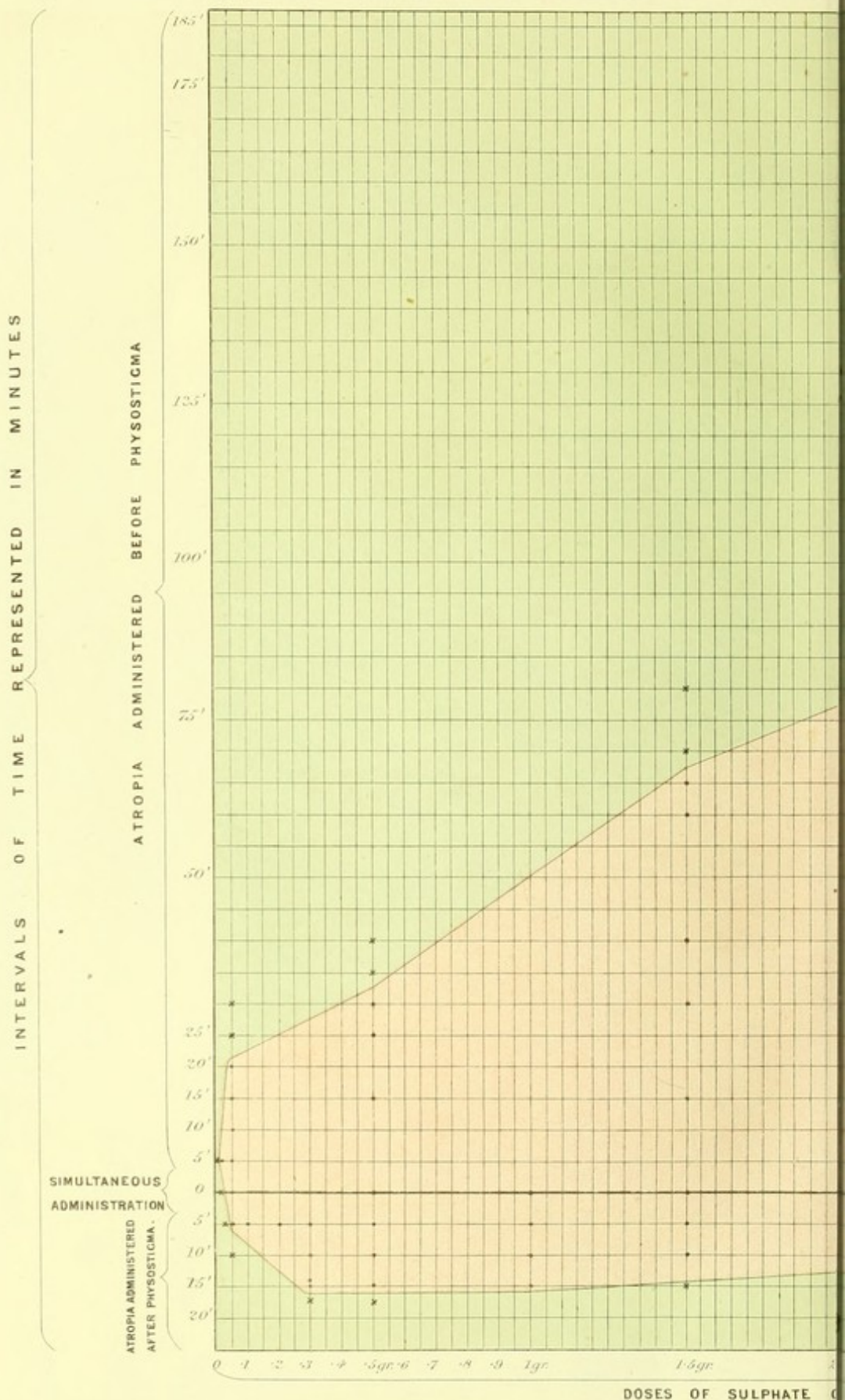


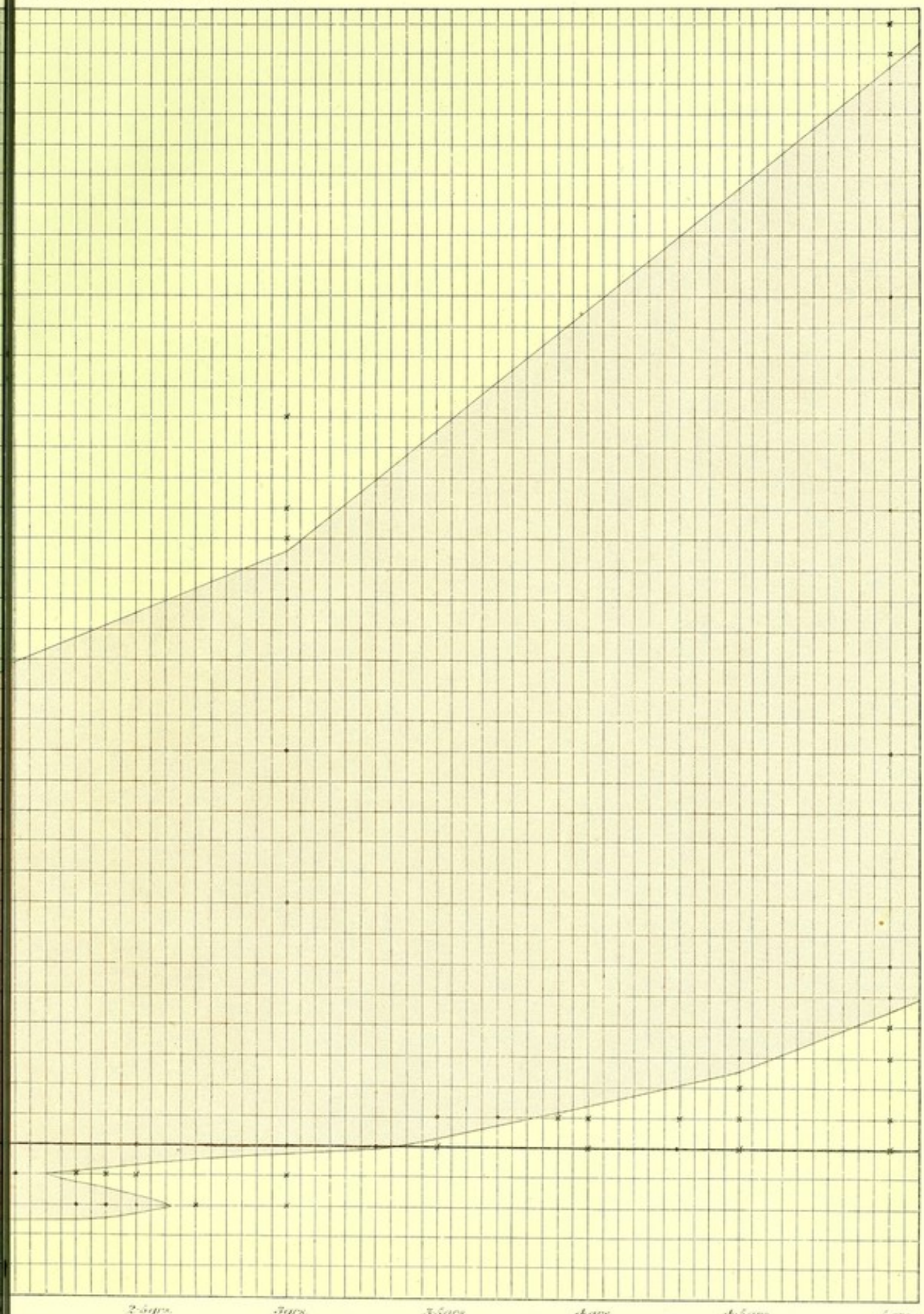
DIAGRAM 5. ILLUSTRATING THE 1ST SERIES OF EXPERIMENTS, IN WHICH ATROPIA WAS ADMINISTERED FIVE MINUTES BEFORE PHYSOSTIGMA.
(THE ENTIRE REGION OF RECOVERY WITH NON-LETHAL AS WELL AS WITH LETHAL DOSES OF PHYSOSTIGMA IS REPRESENTED)

DOSES OF SULPHATE OF ATROPIA (PER THREE POUNDS WEIGHT OF ANIMAL)

DIAGRAM 6. ILLUSTRATING THE 3RD SERIES OF
(ONE AND A HALF TIMES THE MINIMUM-LETHAL
BETWEEN THE ADMINISTRATION OF THE TWO



XPERIMENTS, IN WHICH THE DOSE OF PHYSOSTIGMA WAS CONSTANT
OSE), WHILE THE DOSE OF ATROPIA AND THE INTERVAL OF TIME
UBSTANCES VARIED.



W. & A. K. Johnston, Edinr.