

**An inaugural essay on the causes of sudden death, and the means of preventing it : submitted to the examination of the Rev. John Andrews ..., the medical professors, and Trustees of the University of Pennsylvania, for the degree of Doctor of Medicine, on the 6th day of June, 1804 / by John Rush.**

### **Contributors**

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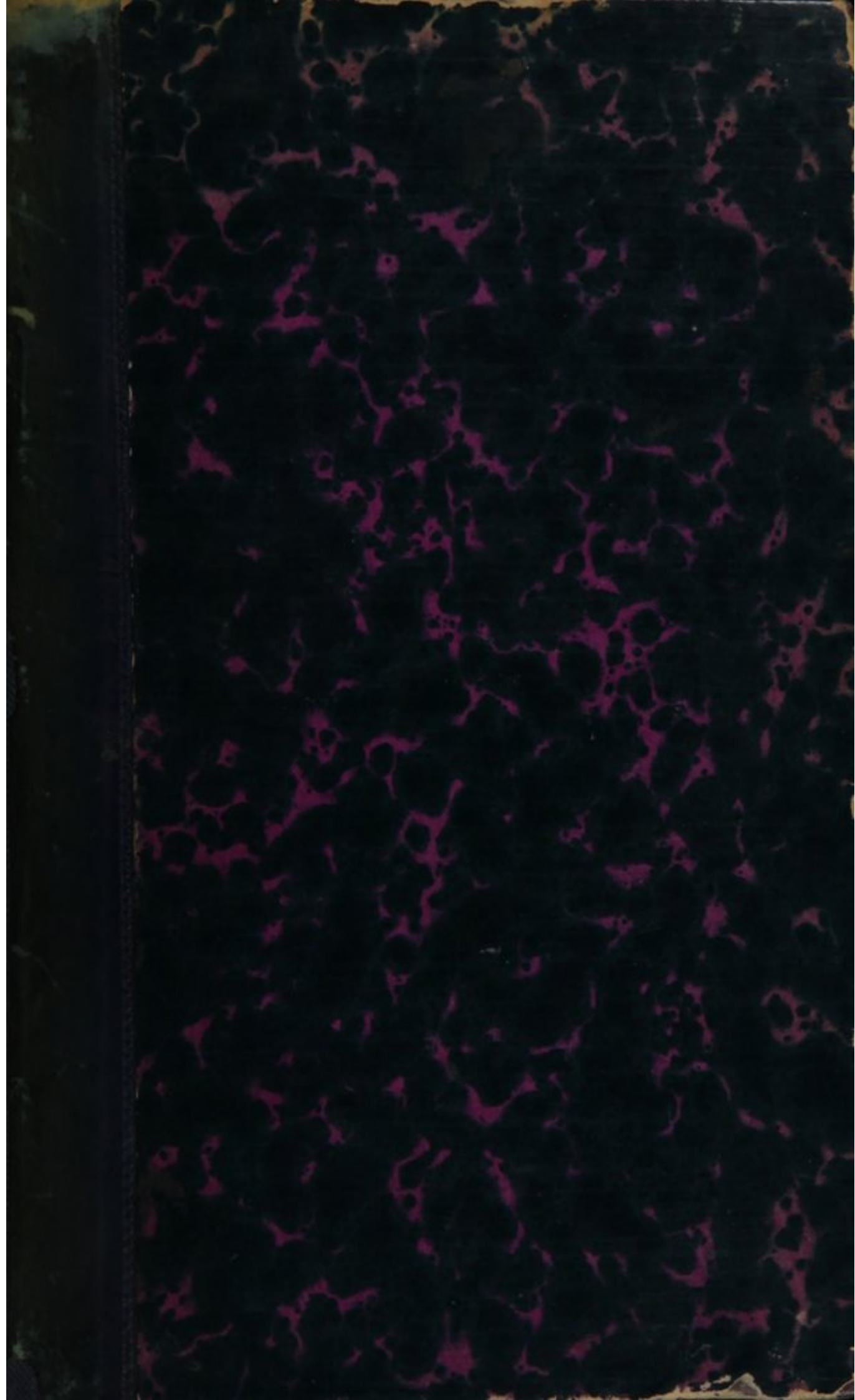
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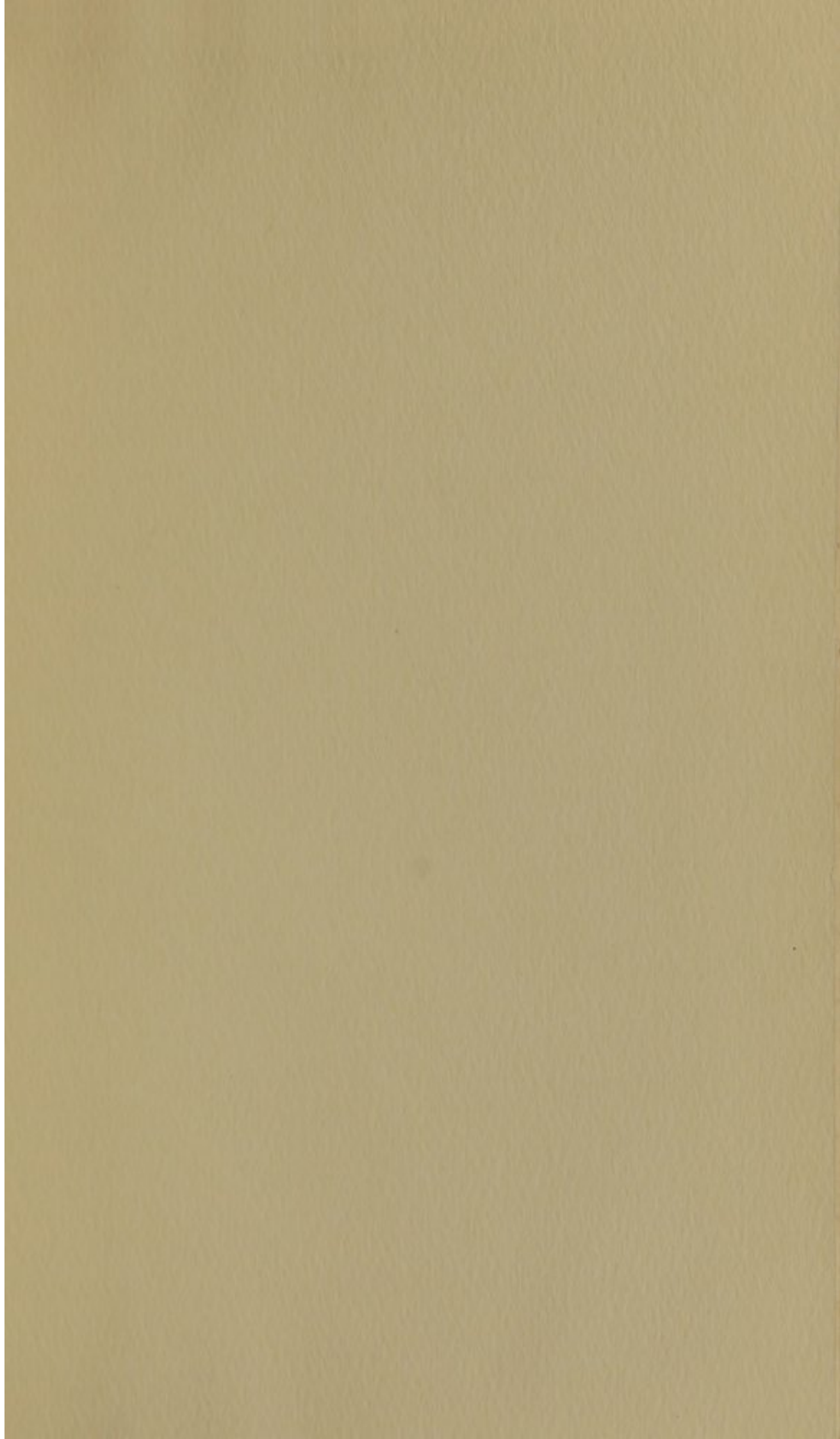
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ANNEX





AN  
INAUGURAL ESSAY  
ON THE  
CAUSES OF SUDDEN DEATH,  
AND THE  
MEANS OF PREVENTING IT.

*SUBMITTED TO THE EXAMINATION*

OF THE  
REV. JOHN ANDREWS, D. D. PROVOST,  
(PRO TEMPORE),  
THE  
MEDICAL PROFESSORS, AND TRUSTEES  
OF THE  
*UNIVERSITY OF PENNSYLVANIA,*

FOR THE DEGREE OF

**Doctor of Medicine,**

ON THE 6TH DAY OF JUNE, 1804.

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BY JOHN RUSH, ✓

OF PHILADELPHIA.

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1804.

THE UNIVERSITY OF CHICAGO

PHYSICS DEPARTMENT

PHYSICS 309

LECTURE NOTES

BY

JOHN H. COOPER

PHYSICS 309

LECTURE

NO. 1

1957

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1957

TO BENJAMIN RUSH, M. D.  
PROFESSOR OF THE INSTITUTES, AND OF THE  
PRACTICE OF MEDICINE,  
IN THE  
*UNIVERSITY OF PENNSYLVANIA.*

SIR,

ALL that a son can owe to a father, and a pupil to a preceptor, I owe to you.

About to enter into the world, and to exercise the duties of an arduous and important profession, my anxiety is lessened, and my hopes encouraged, only by believing, that the principles which I have imbibed under your tuition, will be successfully applied in the cure of diseases, and that I shall continue to enjoy the benefits of your paternal friendship and protection.

That Heaven may long continue to shower down its choicest blessings upon you, is the sincere wish of

Your devoted son, and grateful pupil,

THE AUTHOR.



Presented to J. W. Mendenhall  
by the Author



TO JAMES WOODHOUSE, M. D.

PROFESSOR OF CHEMISTRY,

IN THE

UNIVERSITY OF PENNSYLVANIA.

SIR,

IT is not simply to express my concurrence in the general admiration which your talents and knowledge, displayed in your lectures, have commanded from your pupils, that I have prefixed your name to this dissertation. My chief design in it, is to acknowledge the many obligations I owe to you, as a teacher and a friend.

Be assured, Sir, a sense of your kindness shall always be recollected, with gratitude and respect, by

Your much obliged pupil,

THE AUTHOR.

AND JAMES WOODHULL, M.D.

THE HISTORY OF THE

STATE

OF THE

It is not necessary to state that the following is a  
copy of the original manuscript of the  
History of the State of New York, as  
written by James Woodhull, M.D., and  
published by James Woodhull, M.D., in  
the year 1840. The original manuscript  
is now in the possession of the  
State of New York.

ON THE  
CAUSES OF SUDDEN DEATH,  
AND THE  
MEANS OF PREVENTING IT.

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DEATH is the inevitable lot of all mankind ; but there are few persons, whose business, or whose conduct in life, do not render it a greater evil to themselves and their families, when it takes place suddenly, than when it occurs after a previous indisposition.

To point out the principal causes of the sudden and unexpected extinction of life, and the means of preventing it, shall be the subjects of the following dissertation.

PART I.

It will be necessary to premise, that I adopt, in its fullest extent, the opinion of the professor of the institutes and practice of medicine, that life consists in such a peculiar organization of matter, as to be capable of producing, by certain impressions, those mo-

tions and sensations which have been hypothetically ascribed, by some writers, to the mind, and by others to an independent vital principle.

Death, of course, consists in the destruction of that peculiar organization of matter, or in its incapacity to vibrate with those impressions which produce the motions and sensations of life.

The causes which produce this incapacity in the matter of the human body, and thereby induce sudden death, act with more or less certainty, according as they are more or less combined; according to the nature of the parts of the body on which they act; according as the system is in a state of healthy excitement, or more or less predisposed to death, by previous debility, or by a previous disease.

They appear to induce death, by a sudden destruction of the excitement of the system, from the excessive force of impressions, or from the sudden abstraction of them, whereby the system is rendered incapable of performing its natural offices.

I shall now briefly enumerate the causes, which, by inducing the above changes in the system, bring on sudden death.

1st, Extreme heat, and extreme cold. Both these act with most certainty upon old and sickly people. Dr. Huxham remarks, that old people are often found dead in their beds, after an extreme cold or warm night; and there are few physicians who have not had patients suddenly and unexpectedly snatched out of their hands, by the extremes of heat and cold.

Fatal effects have likewise been observed when heat and cold, in their extremes, have followed each other in a rapid succession. The rays of the sun acting upon the head have often produced death, by means of what is called by the French "*coup de soleil*;" and cold, combined with moisture, has so often induced it in the form of apoplexy, as in some instances to create a belief that that disease had assumed the character of an epidemic.

2d, Sudden changes in the weight of the air. Of this Mulcaille relates several cases, which occurred at Pluviers, twenty leagues south-east of Paris, in the year 1747\*.

3d, Certain matters contained in the air. These are several of the gasses, particularly azote, the carbonic acid, and inflammable air. The black hole of Calcutta will be a lasting monument of the deadly effects of azote or respired air. Many people perish from sleeping in unventilated cabins and rooms, in consequence of the action of carbonic gas, eliminated from burning coals; and it is well known that miners are often destroyed, by breathing the inflammable air which is discharged from subterraneous caverns. To these noxious airs, some have added certain vegetable poisons, which are said to float in the atmosphere; but since the rejection of the fable of the East India upas tree, sudden death from this cause has been dis-

\* Southwell's translation of the Medical Memoirs of the Royal Academy of Sciences, vol. 11.

carded from medicine. The air in the vicinity of the *rhus radicans* has been known to induce fever, and to inflame the skin, but I believe in no instance has it suddenly extinguished life. To this head belong the miasms which exist in the atmosphere from the putrefaction of animal and vegetable substances. The histories of the plague in the old world, and of the yellow fever in the United States, furnish many proofs of sudden death from this cause. This is not the place to enquire whether those diseases or death can be induced by a matter secreted in a morbid body, and conveyed into a healthy one. Sudden death has sometimes been brought on by entering a small and filthy room, crowded with persons ill with the plague; but the matter which induces it is not secreted; it is like the original miasms, the offspring of putrefaction, and in these cases derived wholly from stagnating excretions from the bodies of sick people. As I am only relating facts at present, I hope I shall be excused from deciding on the long agitated question of *the part of the body* on which the airs and miasms, that have been mentioned, primarily and chiefly act, in producing their deadly effects. Some of them certainly act upon the body, through the medium of the lungs; some of them upon the whole nervous system, through the medium of the brain; and some of them upon the sanguiferous system and blood, through the medium of the stomach. It is possible, miasms may convey death into the body, through the avenues of all the parts that have been mentioned.

I have said nothing of sudden death from contagions. They are extremely limited in their number, and seldom so powerful, in their first impressions, as to extinguish life. Cases of sudden death from the small-pox, measles, and hooping-cough, are, I believe, rarely to be met with in the records of medicine.

Lightning is often a cause of sudden death. It seems to act primarily upon the nervous system, but the blood and all the muscles of the body appear to partake of its forcible impression. Hence the quick putrefaction of the body after death from this cause.

5th, Sudden and violent emotions of the mind. The return of a long-absent and favourite son from his travels, once produced death in a father. Anger has, in two instances, produced sudden death in this city. Terror has often occasioned it. Soldiers have sometimes been found among the slain in battle, whose bodies have been free from wounds. Their deaths have been ascribed to the wind of cannon balls. Is it not probable they were occasioned by the violent impression of terror upon their systems? Trifling wounds, it is well known, have now and then brought on death, from being combined with a sudden paroxysm of fear. The passions of grief and fear have occasionally induced sudden death, but it is more common for them to induce it by a previous chronic disease. Under this head we may bring in, as a cause of sudden death, a sudden sense of guilt and shame. Of this there are several instances to be met with in practical authors.



6th, Great bodily exertion in labour, lifting weights, and in marching, have sometimes suddenly destroyed life. Fatigue, or the reduction of the excitement of the system in marching, more certainly induces sudden death, if it be combined with excessive heat. The histories of the late French and English campaigns in Egypt furnish a number of instances of soldiers expiring on the public roads, from the combined effects of the rays of the sun, and great fatigue acting upon their bodies.

7th, Great bodily pain has sometimes induced sudden death. The colic often kills by excessive pain. Mr. Hunter relates an instance of the pain occasioned by the extirpation of a diseased testicle producing death\*. A similar instance occurred in France, in a great military officer, from the pain induced by cutting for the stone.

8th, In fevers, sudden death is sometimes brought on by the inability of the blood-vessels to re-act in the chilly fit; by the excessive force of their re-action in the hot fit; by convulsions; and by the extreme debility which follows the termination of a paroxysm of fever.

9th, Affections of the head, from the gout, are frequent causes of sudden death. The most common of these are pressure of water or blood upon the brain, inducing apoplexy.

\* Essay on Inflamm. vol. II, p. 122.

10th, Death is sometimes the effect of a sudden effusion of blood or water in the lungs, constituting what has been called by my father, in his lectures, "the apoplexy of the lungs."

11th, A spasm of the heart, produced by the gout, has, in several instances, induced the sudden extinction of life. A respectable citizen of Philadelphia died of this affection of the heart, a few years ago, after a few hours indisposition, with all the usual symptoms of angina pectoris.

12th, Certain poisons, and many substances of an indigestible nature, also cold liquors, when the body is preternaturally heated, received into the stomach, by their sympathy with the head, heart, or blood-vessels, induce sudden death. It has sometimes followed a spasm in the stomach from gout, also a rupture of that important viscus.

13th, The discharge of pus from the liver into the thorax, and into the abdomen, has often hurried persons suddenly out of life.

14th, Worms in the alimentary canal have now and then suddenly destroyed life, especially in children, by exciting apoplexy, or general convulsions.

15th, The sudden rupture of an aneurism, in the large blood-vessels near the heart, has often become an instantaneous outlet of human life.

16th, It has passed away with nearly equal rapidity from a rupture of the bladder and the uterus. It has been induced by syncope, from partial and general causes.

17th, The sudden reduction of the excitement of the system, by hemorrhages, by parturition, by a large stool, by a copious discharge of matter from an abscess, and perhaps by the cessation of pain, has, in sundry instances, brought on sudden death.

18th, Derangement producing suicide. I have ascribed this cause of sudden death to a disease, for such is its contrariety to the natural principles of action in man, that I believe it rarely takes place in the perfect exercise of his reason.

I shall say nothing of the causes of sudden death from drowning, external wounds, and accidents, as being foreign to the subject, and proceed briefly to mention the means of preventing it. I shall confine myself only to such cases as are within the power of medicine.

## PART II.

1st, To prevent death from the extremes of heat; cool dresses, drinks, and situations should be advised. As it frequently occurs in the night, and during sleep, in hot weather, a counter-stimulus should be opposed to that of heat, by recommending to old and weakly people to lie constantly on a mattress. To prevent it from cold; warm, but light bed-clothes should be prescribed; and as death makes its first approaches through the feet, great pains should be taken to keep them constantly warm, by means of warm bricks

wrapped in flannel, or stone jugs filled with hot water. The fatal effects of a stroke of the sun are to be prevented by constant and gentle exercise, when persons are exposed to its rays, and by protecting the head by the use of an umbrella, or a deep-crowned hat, covered with white linen or paper. The Egyptians, says Mr. Dewar, use a turban for this purpose. It is true, it accumulates the heat of the head, but this heat, he remarks, is less, and far more tolerable, than the heat of the sun, which, in the climate of Egypt, is often between 120 and 130 degrees. Within these degrees of heat, I have seen the natives of Bengal rowing their boats on the river Hoogly, exposed to a meridian sun, and bare-headed, without experiencing any ill effects. The only precaution they used was, to keep their heads constantly wet, by pouring over them a large gourd full of water. By these means, the neck, shoulders, and chest, which like the head were exposed to the sun, were kept cool, from the evaporation of the water.

2d, During the prevalence of the winds, and that kind of weather which dispose to sudden death from apoplexy, great care should be taken to lessen the predisposition to it, by temperate diet, and gently opening physic.

3d, To prevent the fatal effects of the gasses that have been mentioned, places which are supposed to contain them should not be entered, until they have been examined by a lighted candle. The extinction of its light, is a sign of its containing azote or carbo-

nic gas. A flame or explosion excited by the blaze of the candle, indicates the presence of inflammable air.

The deadly effects of the miasms from putrified vegetable and animal substances, are to be prevented by avoiding the places which generate them, by lessening the predisposition to be affected by them, by means of abstemious diet, gently opening physic, and a temporary issue, excited by a blister on one of the limbs. Of the efficacy of these preventives there are many proofs in the history of pestilential diseases.

4th, The means of obviating sudden death from lightning, belong to natural, not to medical philosophy.

5th, The preventives of death from violent emotions of the mind, should be sought for in those books, which inculcate the subjection of all its faculties and operations to the dictates of reason and religion.

6th, Labour, and exertion disproportioned to the strength of the body, should be carefully avoided by all who wish to escape a sudden passage out of the world. The combined influence of heat and fatigue upon life from labour and marching, may be obviated by counter-stimuli. Ardent spirits have generally been resorted to for this purpose, but garlic or raw onions are to be preferred to them. By the constant use of these cordial vegetables, the Hebrew nation were enabled to sustain the labour of making bricks in the open air, exposed to the intense heat of

the climate of Egypt. The deadly effects of heat and fatigue were prevented by a part of the British army in the same country, during the late war, by allowing the soldiers but a small quantity of water. Similar advantages are derived from abstaining from water altogether, by the Indians of North America, during the day, in their long and fatiguing marches in hot weather.

7th, Death from extreme pain may be prevented by bleeding, opium, hunger, and giving vent to its sensations by cries and groans. Of the efficacy of hunger in easing pain, Dr. Priestley related the following:—In travelling through Germany, he passed through a village, where a criminal was exposed to torture once a week, in order to extort from him a confession of his accomplices in his crime. Three days before he suffered, he avoided tasting any food. The sensation of hunger, thus induced, was so painful, and at the same time so harmless in its effects upon life, as to overbalance the pain and danger of the tortures inflicted upon him. The death of the French general, who expired under the operation of lithotomy, was ascribed to false ideas of courage. He considered it as incompatible with the honour of a soldier to utter a cry or a groan, and thus died by creating an artificial and destructive accumulation of excitement in the organs of sound and speech, in order to lessen the painful impressions of the gorget.

8th, Unexpected death in the chilly fit of a fever, should be obviated by warm drinks; from excessive

force of re-action in the blood-vessels, by bleeding; from convulsions, by remedies suited to the stage of the disease in which they occur; and from the debility which follows a paroxysm of fever, by cordial medicines, drinks, and aliments.

9th, Sudden death, in persons predisposed to it from apoplexy, should be obviated by temperance, moderate exercise, open bowels; not suppressing usual evacuations, nor changing old habits; by occasional bleedings, when the premonitory signs of vertigo and headach take place; by avoiding tight ligatures around the neck; by sleeping with the head a little elevated, and upon a mattrass instead of a feather bed; and by never sleeping upon the back, but alternately upon each side\*.

10th, The sudden extinction of life by apoplexy of the lungs; by poisonous and indigestible matters received into the stomach; by worms in the alimentary canal; and by a spasm of the heart, should be prevented by the usual remedies for that purpose, mentioned in the books of medicine.

11th, Sudden death from cold liquor, taken into the stomach when the body is preternaturally heated, has often been prevented in Philadelphia, by conducting off the heat of the body, by plunging the hands and

\* My father, in his lectures last winter, mentioned seven cases of palsy (a disease produced by a more feeble operation of the causes which produce apoplexy), in each of which the patients acknowledged they had been in the habit of sleeping constantly upon the same side.

feet into cold water, or by washing the mouth with it, or by grasping the vessel that contains the liquor, provided it be made of a metal, or of any kind of earth.

12th, Persons predisposed to gouty spasms in the stomach or heart, should avoid the remote and exciting causes of gout; but when attacked by it, should fly to laudanum, until the advice of a physician can be obtained.

13th, When danger is apprehended of the sudden discharge of pus from the liver into the thorax, pericardium, or abdomen, it should, if possible, be diverted externally, by means of a caustic. Pukes which emulge bile from the liver into the stomach and bowels, would perhaps have the same effect upon its purulent contents. The ducts which lead to the duodenum would probably yield to the agitation excited by a vomit, sooner than any other part of the liver.

14th, Sudden death from aneurisms has often been prevented by a temperate diet, tranquillity of mind and body, and by small and frequent bleedings.

When sudden death is apprehended from syncope, great pains should be taken to avoid its remote and exciting causes, and to strengthen the system by tonic remedies.

15th, The sudden extinction of life from sudden depletion, or the sudden collapse from distension, or cessation of pain, should be obviated by vicarious sti-



muli of other kinds, where they cannot be prevented by other means.

16th, Where there is reason to apprehend a sudden death from suicide, persons suspected of it, should be narrowly watched, and all the means of death should be removed out of their sight, or they should be removed from them. Solitude should be prevented, and cheerful society, or a cheerful glass, should be advised. The excitement of a strong emotion of terror and pity has prevented it in two instances, when the patients werè just about throwing themselves into a river. The former was produced in a Frenchman in London, by an attempt made upon his purse by two robbers; the latter was produced in the well-known Mrs. Bellamy, by the cry of a child in distress.

17th, In cases of sudden death, from many of the causes which have been mentioned, it is probable resuscitation might be effected by the usual means, when judiciously applied. In the use of them I shall only deliver the following directions :

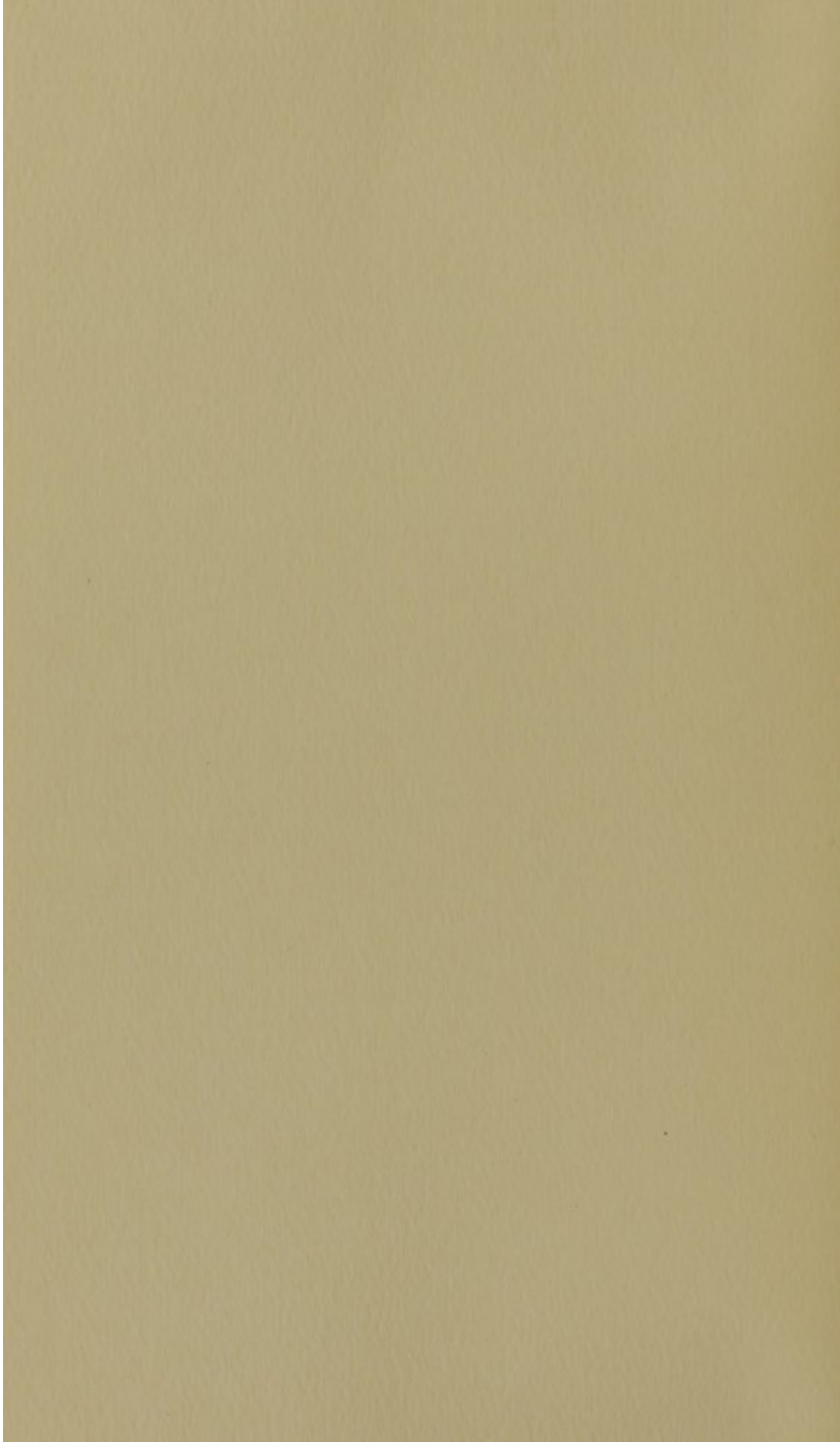
1st, Begin with such as are of a gentle nature, and gradually resort to such as are more powerful in all cases where the cessation of the functions of life has been induced, by causes which leave the excitability of the system in an accumulated state.

2d, In cases when, by great exertions to preserve life, the excitability of the system has been expended, let no stimulants be applied for some time after the cessation of apparent life. By observing this delay,

time will be given for the accumulation of some of the feeble remains of excitability in the system.

3d, In addition to the common remedies employed to effect resuscitation, feeble or loud sounds applied to the ear are calculated to produce the most salutary effects. "Life often lingers longest on the ears\*." This has been proved by the shrieks of distressed persons sometimes calling their apparently dead friends to life. By availing ourselves of this fact, a new and powerful remedy may be added to those which are now in common use for promoting resuscitation. That the motions of life are destroyed last in the brain (and of course in the vicinity of the ears), I think highly probable from the placid, or gloomy countenance which succeeds death. They are both probably the effects of the pleasant or painful operations of the mind, which survive the extinction of life in other parts of the body.

\* Rush's Lecture on Asphyxia.



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