On the Causes of Predisposition to Epidemic Disease.

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Outline of Thesis.

Ist. Introduction.
IInd. Statement of Facts.
IIIrd. Example.
IVth. Answer to Objections.
Vth. Conclusion.

Addenda.
On the Causes of Predisposition to Epidemic Disease.

Introductory Observations.

One of the most remarkable elements in the organization of man consists in the possession of a reasoning and intelligent soul; by virtue of this faculty of reason, he is separated from the lower animals; for although metaphysical doubts have been raised as to the possibility of distinguishing some men from monkeys, the dignity of the human race is often being seriously compromised by mimetic vicious fellows. Still by virtue of this faculty, he is enabled to form an estimate of his relation to external objects around him, to in possession of which, with he can sound the depths of his intellectual curiosity.

There would also appear to be a principle implanted in the human mind, that intuitively seeks for a rational causation; that is to say, for an explanation of the phe-
noumena presented to its observation. The natural tendency inherent in the constitution of man's intellectual nature, would appear to be, to infer causation from every succession of phenomena. I to confound the true relation that subsists between cause and effect: perhaps nowhere in the whole range of physical or biological science, is this flaw more difficulty encountered, more than in the subject of medical causation. Our ideas of causation, reasoning à priori, too often being derived from fortuitous circumstances: the sources of fallacy too often eluding our observation; we being too prone to build systems of conclusions of our own, founded apparently with every appearance of plausibility, but frequently, premature. Iende in the extreme.

It has been supposed by some, that in proportion as things are traced to their causes, so much the more is the necessity removed of admitting the existence of a higher or final cause in nature. Without referring to those series of causes having reference to unity of design in the phenomena...
scene of nature. I may just state, that by the
pursuance of such a course of reasoning, the
mind becomes more and more involved in its
own schemes, I would come at length, to look
upon its own conclusions as final. Common
reasoning should teach us to go in quite an
opposite direction. The more we discover
new laws, the more rational it is to believe
that there was some one who made them;
the more universal the diffusion of those
laws, the more they exhibit the cause of the
concentration of causes, which combined
to produce them.

But the science of a rational etiology,
in contradistinction to an empirical one,
demands that we should advance, in all
our investigations, with the utmost circums
pection, that we should ever bear in mind
the sources of fallacy to which we are liable,
in assigning to a succession of events, the
relation of uniform sequence, confounding
the true antecedents of an event, with
results entirely incidental.

So less important is it, that in all
our researches after truth, its investigation should be conducted on strictly philosophical principles. To the many lamentable instances, where from a non-acquaintance with this fact, the most ridiculously absurd theories have been promulgated, I need not advert. The whole history of scientific literature furnishes numerous instances. That of chemistry may be taken as an illustration. Chemistry as a science, may be said to have emerged in later than the last half-century, from a state of chaos, to one of order, since its practitioners have been freed from the alchemical bias. It is in modern times only, that it has assumed a real value. In practical importance, under the limited prosecution of researches of those eminent men, who abandoning the absurdities of vague theories of the early chemists have contributed greatly, by conducting their inquiries upon strictly philosophical principles, to emancipate chemistry from the trammels of delusions of romanticism. It is not my object in
this place, to advert to the uninstructable theories & speculations which were entertained by the so-called philosophers of that pre-
tended science, termed Alchemy. I can only 
here, just observe in passing, that if their 
theories, many of which have passed current, as 
philosophical speculations, have been grand, 
not on purely philosophical principles (for 
even in those early times, their theories were 
professedly based on purely philosophical 
grounds, but which one nevertheless, most 
frequently, are extremely hypothetical character, 
but upon a mixture of philosophical, with 
legendary & fabulous systems, couched in 
the technical language of their schools, 
concealed under a barbarous & en-
thymatical nomenclature.

On the importance of the subject, 
about to fall under our consideration, 
it would be almost superfluous for me 
to dwell. It must be evident to all, 
who value that greatest of earthly blessings, 
Health, that it is well for us to be informed 
as to the many causes, which are in operation
to render our bodies susceptible of the first impressions or inroads of disease. We regard Health as the basis of all our temporal enjoyments. If the Ancients, in a just appreciation of the noblest gift of a wise Creator, ranked health, amongst their tutelary divinities, by raising it to the dignity of a mythological goddess, can be of the present day, for one moment, entertain a doubt as to the importance of securing the best means, calculated to preserve it, in all its pristine vigour and integrity.

The subject is replete with interest to the mind of every intelligent medical man. When we learn, that in the Fourteenth Cent. 26th, one quarter at least of the population of the old world, was swept away, in the short space of 4 years, that some countries, England among the rest, lost more than double that proportion of their inhabitants, in the course of a few months, can such facts create any but the strongest emotions, if any further elucidation were needed to urge us to the consideration of the nature
of epidemics, it might be found in the threatened
occasions of those fearful scourges, that
annually visit and devastate our population.
The subject regarded either in a legis-
lative, sanitary, or social point of view,
demands our strictest attention.

Need I ask, that a fearful responsibility
is incurred by those who have the in-
terests of large bodies of men at stake?
Are those who are appointed to stand at
the helm of our legislature, to be backward
in the interests of our fleets & armies, that
constitute the support & barrier of our state?
Is it I ask, demanding too much, that
the rulers of our constitution should become
conversant with the means by which the
health & longevity of the nation be prolonged,
the causes of decline & pestilence be
ascertained?

Again considering the subject, in a legis-
latory point of view, is it asking too much
from those who may be appointed to regard
into the sanitary condition of our large towns,
that they be required to carry into full effect.
such measures, as may be considered advisable, in reference to all drainage or sewage?

If we are here enough to consult with the utmost prudence, concerning all measures that are calculated to widen the basis of our manufacturing greatness or commercial prosperity, by multiplying the comforts, conveniences or luxuriant life; how comes it, that we should be wanting in endeavoring to ascertain, that causes may be found, to diminish down with such unremitting severity, the flower of our youth or country.

Lastly, is it going too far to say, that regarded in a social point of view, nothing is gained beyond a more physical advantage; may not the due enforcement of such sanitary precautions, be said to exercise a moral, as well as a physical influence, over the character of all those who may be subjected to such sanitary regulations.

I repeat once more, the subject is deserving of our utmost attention I suggest.
At vero si de injustis modis pendibus plur'a
verba fecero, melioris mentis hominis
meritis mihi forte succensaunt, dicatque
me potuisse faciun sermonem, quem ipso
conditoris nostri verum hymnum compos.

Saelu. Lib. III. P. 86. line 35.
Claudii Saelui Payamni de Utr Rar.
tivum. Colpois Rumanii.
reflections of the most important kind. If modern science, with all its anatomical and philosophical discoveries, has not been content in its appreciation of one of the noblest wonders of a Creative Intelligence — the construction of the human body — has it been one whit more deficient in deciphering that class of phenomena, which constitute a marked deviation from the normal standard of health, which phenomena we interpret or designate "disease"?

If so, then in the midst of an anatomical analysis of the human body, gave vent to his admiration in the following sublime apostrophe: "O thou, who hast made us! in composing a discourse so sacred, I wish I am chanting a hymn to thy glory."

Can it constitute for us a basis instructive lesson in intellectual discipline, to rest upon a study of those causes, or modifying principles, of epidemic disease, by which such destructive and fatal deviations from the normal standard of our physical organization are accounted for?
I need hardly say that we should not leave one stone unturned, one source unexplored, till we have succeeded in determining the causes of such fearful calamities.
Statement of Facts.

The object of my design to undertake, is the investigation of those causes of predisposition to disease, or, under our bodies, susceptible of attacks of epidemic disease. Now as some of these causes of predisposition are apparent enough at first sight, whilst others again, are hidden or obscure; it will be advisable in the present instance to adopt a two-fold division into Ascertained and Uncertained Causes. But before proceeding to set down the actual facts of the subject, it will appear more satisfactory to establish a correct definition of the various terms, introduced under discussion. My reason for pursuing such a course is, because it is often considered necessary, in laying down the definition of a subject, that other definitions be referred to, their correctness called in question; now as an examination of all the definitions that have been given will lead to much that is uninteresting, I beg to direct a deal of the instinctive verbal controversy. I shall therefore extend the meaning of the term Epidemic, beyond its popular use, to comprehend in the widest acceptance of the term, that which is deemed admissible, all infectious or contagious diseases, which attack many people at the same time, in the same country. I shall lay it down as an essential point, that it is considered of temporary, in contradistinction to a permanent character. The most ancient medical
treatise in the world, that contains any information regarding the nature of epidemics, or that offers any sanitary precautions for the public health, is contained in the
20th chapter of Leviticus. Upon reviewing the admirable regulations contained in the Mosaic code, we shall find their rigid effect in the refugee. One wonders when we consider the loathsome nature of the diseases, against which they were intended to guard. Upon turning however to the book of Leviticus, we notice, that there is not a word said about the medical treatment of the disorders brought under our notice; all that is stated refers to the cognizance of symptoms, of infectious disorders. Of the sanitary precautions for the public health, it may in consequence become necessary. But this is all of which legislation can properly take cognizance. Certainly no Oriental nation, ancient or modern, possessed a sanitary code, in the slightest degree comparable to that of the Hebrews. It indeed scarcely can be said to be equalled by the regulations of the best European Lazarettos. In entering then upon the subject of the causes of predisposition to disease, it must be remembered, that although in some cases, the causes that render our constitutions more susceptible of the attacks of disease are apparent enough, that in some cases the predisposing cause of mortal...
as an exciting one, at the same time still that epidemics occur, we can trace no appreciable predisposing cause what- ever. In many instances, we cannot frame our theories from one isolated cause alone, but must take into consider
ation, the influence of more additional co-operating causes. Again it frequently becomes almost impossible to
determine satisfactorily what co-operating influences
may be at work. All we can say just now in the present state
of science is, that there are some additional causes, but if
their nature, we are quite in the dark. Frequently their origin
considered as a modifying cause of disease is very prob-
lematical; but nevertheless it is our duty to inquire what
these causes are; the very fact of the greater duration of
life at the present day, shows that only the causes at least
is owing to improved habits of life, a better knowledge of
diseases. Essential precautions, necessary for health.
Nothing indeed can invalidate the painful truth, that
a very large proportion of our population sustain a fear-
ful rate of mortality, that principally from causes that
are evidently self-inflicted, or at least self-mitigable.
When we consider the many changes that are attendant
upon a large population, by which sustain such a tremen-
dous mortality; the depressing influences of civic life;
in that all the evils that launch our population int
the defect of accuracy, leaving them open to the reckless indulgence of all the degrading excesses, that so many of our towns. (The point is this: the question comes to be, is it not possible to mitigate the dangers arising from such excesses? It is a question, for the strictest inquiry. I trust no persecution shall compel us to the least of some faint principles to guide us, consequently a certain embarrassment from a deficiency of data, must attend all our inquiries. How often do we not, in referring to the works of those who have treated of this subject, find that we become entangled in the maze of an unintelligible phraseology; the vagueness of the terms employed, coupled with the vacillating state of medical science, in this day, together with the multiplicity of heterogeneous opinions, all tend to bewilder our ideas. Of the only claim that many of these principles have, couched as they are in the most unmeaning phraseology, is that of the venerable sanction of time, always peculiar to monuments of antiquity. What we want is a rate of mortality, deduced from a correct summary or register of deaths. If this statement be the science of statistics, is made contrast with the average amount of a population; the progress of its commerce, manufactures &c. any
...in the population occur, he is in the post-sensitive ramement of the discovery of such a decline; with such facts before him, may possibly remove the causes. In like manner the medical man, if in possession of statistical records, has got something like a clue to the causes of liability to disease. How much more important then does the use of statisticians become, when we extend our observations to epidemic diseases, to private entire communities at large. It is almost appear superfluous, to have dwelt any further upon this, but knowing how many there are, who in the acquisition of new and knowledge, have a tendency to make inferences, in accordance with their own prejudices, or to suit some longcherished theory, pursue this prejudiced system of first forming a theory, then setting out in search of facts to rest in its support, instead of the more philosophical method of first rigidly and conscientiously fact from fact, to deduce sound and practical conclusions.

It shall now be my task to endeavour to show, that these causes of predisposition to epidemic disease are; to show how disease and death may be made to yield still...
further, before the gradual & steady extending line of preventive measures.

I shall therefore in accordance with the tabular outline set forth at the beginning of this subject, divide these causes of predisposition to Epidemic Disease into 7 classes: these being for examples:

I. WANT OF ATTENTION TO CLEANLINESS.

II. DEFICIENT VENTILATION.

III. IMPERFECT SYSTEM OF DRAINAGE & SEWAGE.

IV. INTUMESCANCE OF ALL KINDS.

V. OVER-CROWDING.

VI. DECAY OF ORGANIC VEGETABLE MATTER.

VII. FOOD: INSUFFICIENT IN QUANTITY & QUALITY.

VIII. INSUFFICIENT CLOTHING.

IX. FEAR, TERROR, MENTAL STIMULATION, considered as so many causes of predisposition.
Part III Example.
Food insufficient in quantity or quality. It is generally admitted by physiologists, that the activity of the human body, in the formation of internal heat, though dependent in a great degree on the original constitution, is powerfully affected by the quality, as well as the quantity of the food consumed. It is more or less apparent, that to excite the heating power of the living principle in man, there is nothing found by experience so valuable as an oily diet. All reports concerning large bodies of men, show that want of attention to diet constitutes a strong cause of predisposition to epidemic disease. Bad water and bad food lead to the development of sepsis. It is rarely understood if in the first instance we premise, that certain functions belong to the blood, chiefly dependent on the nature of its chemical constitution, that any deviation from the ordinary diet will account for corresponding changes in its constitution, thus become a source of disease. Thus any deficiency in its alkaline quality, or in the composition of its acid constituents, may be productive of different diseases, as sepsis. One of the most requisites in the preservation of health is a sufficient nutritious food; all raw or ill-cooked nutri-

Текст изображения страницы документа, а также ранее извлеченного текста для него. Возвращайте представление текста в формате естественного чтения. Не возвращайте собой.
to receive the greatest care, in the selection of drinking water. It may not be uninteresting to quote a passage from an article, by Dr. J. Batting, on decaying vegetable matter in wells, as being productive of disease. (Indian Archives, Vol. 1855, p. 57.)

This gentleman remarks, that he has had many opportunities of observation in the Southern Mahratta country, in the jungles at the foot of the Deccan, in Gujarat, Ceylon, and other countries, and having gained confirmation of his opinion that the health of the population of jungle districts is more affected by the bad water of these districts throughout the year, than by the malarial, though more deadly, is only in operation for a very limited period. He believes that many jungle districts can be rendered comparatively free from fever, if absolutely healthy to the inhabitants, simply by the construction of proper wells. He refers to recent instances (not in jungle districts, however) in which water, rendered unsafe by decomposing organic matter, induced various diseases in bodies of men (from bowel complaints) it was at once affected by water being
Proceed from June 2nd.
Insufficient Clothing as a Cause of Predisposition

Whether inhabiting a tropical, temperate, or arctic region, existing in abject barbarism, or enjoying the highest degree of civilisation and refinement, man is essentially a clothing animal. Some kind or other of clothing, or decorative appendage, he always affects, being indebted to this necessity by motives of defence, shelter or decorum.

Leaving aside these, the consideration of all dress or armour of a defensive kind, clothing must be regarded simply in the light of a protection from the extremes of heat or cold, so that the body may perform its functions healthfully, without obstruction. Clothing, to be in proportion to the temperature of the climate of the season of the year. The under clothing, invariably of flannel, is remarkably well calculated to preserve uniformity of temperature as well as to produce a healthy irritation of the skin. The advantages of good efficient clothing, as a preservative from disease in warm, as well as in cold climates, is now so well understood, that in our fleets and armies, its use is with great propriety justly insisted on.

It is easy to adduce strong evidence in behalf of the value, importance, of wearing flannel against the skin. It is now a matter of statistics, for during the progress of expeditions, notes have been made of the number of
his station with a crew of 100 men, visited almost every island in the W. Indies, taking up the ports of the Gulf of Mexico; notwithstanding the sudden transition from extreme climates, returned to England without the loss of a single man, or having any sick on board, on his arrival.

It is not going too far to ascribe this excellent state of health solely to the use of flannel, but there can be little doubt that the latter was an important element in Captain Jumays success.

There can, therefore, be no doubt, that insufficient clothing, is a strong cause of predisposition to disease; and there can also be no doubt, that woollen fabrics, such as flannel, are by far the best articles for being worn next the skin, when the body has to be exposed to such a depreciation of such a degree, as increases the perspiration in a material degree. It retains a warm and dry atmosphere next to the body, while from its porous and fibrous character, it carries off the moisture to the external surface of the flannel. Dr. Higginson, in his Lectures on Therapeutics of Physicians says, that the use of flannel was found to be beneficial in the prevention of cholera, by maintaining
Want of attention to cleanliness, as a cause of predisposition to epidemic disease.

In proportion to the rank and advancement of any nation in civilization, in that proportion does with the value of personal cleanliness increase. It constitutes almost a part of the moral condition of barbarous nations, that they shall disgracefully deficient in this virtue; whilst the most polished nations, pay the greatest care and attention to it, as crowned by the almost universal use of baths.

The use of the bath, has existed in all probability from the beginning of the world, since it is founded in the most natural wants of man. In barbarous ages however, in which we had as yet, accomplished nothing for the conveniences of life, men most rarely plunged into rivers, streams, or such-like natural reservoirs of water. It is to the Oriental nations, the earliest reapers of the benefits of civilization, that the arts made the first efforts to perpetuate the taste for the employment of warm baths. Greece, in like manner, knew the use of warm baths, in the time of Homer; for mention is made of them, in several passages of the
Hyberniam, fructa pluae, dexters et incernem
Te maiestino, Tyberi megethor. Sat. VI. 923.
writings of that poet. Among the Greeks, the Bac-
demonstrous, were the first who adopted the custom,
borrowed from Asiatic nations, of appearing naked
at the public games, anointing themselves with
oil, covering themselves with sand, prior to the
contest, then plunging into hot-baths. In like
manner, baths constituted one of the requisites for
the effeminate and luxurious life of the Romans.
The Imperial Thermae of Rome, forming the most
complete establishment that could possibly be
imagined; containing apartments, not only devoted
to the various processes connected with an elaborate
system of bathing, but combining all that airy
grandeur and magnificence, that could possibly
embellish such salutary useful edifices.
But such an importance did the Ancients, attach
to cleanliness, that we find the inelemencies
of the bath, did not appear to deter them from
performing their usual ablutions; for we find
the Roman Satiret Jovinal, in his description
of a superstitious woman, representing her, as breaking
the ice of the Tiber, in order that she might perform her ablutions
"Heberrum, praeta glacie, descenderit in annum
ter matutinis, Hebrii mergitur" Sat. VI. 523.
And even in the present day, in the last three centuries, cleanliness of person is amongst the first obligations of religion. The baths still preserve, all the luxury of both the Grecian and Roman periods, and re-established, if the loftiest architectural pretensions.

The effect on the health of a community, by attention to personal cleanliness, is shown by the less frequent attacks of severe epidemic diseases; not that, we shall find, even in the days of the ancient Romans, that their capital territories were frequently almost depopulated by visitations of plague and pestilence; the results of a signal contempt for attention to cleanliness, ventilation, etc.

In like manner, we have only to look to our own country for similar examples. That dreadful catastrophe, the Plague of London, in 1661, that swept off its thousands of thousands, we must not, in the spirit of a bygone age, regard, as the random infliction of a beneficent Providence, but rather as the direct consequences of the neglect of certain organic conditions, a result of the direct infringement of one or more of the laws, decreed by the Creator, for the maintenance of health. If the effects however, of want of attention to cleanliness, hardly any one can doubt. The ravages
that Infection will commit; whereas Cleanliness is neglected are fearful. Of the proofs of this, we have only to observe the fearful deprivations it commits among the dwelling houses of the poor, in all our large towns. And can the prevalence of Infection be doubted when we take into consideration, that in our best regulated cities, there are but indifferent sanitary arrangements? We find large collections of animal excrement of various kinds; a daily increase of filth; a consequent pollution of the atmosphere, necessarily takes place. When we look around us, we see what Equal pestilential clouds exist in all our great cities; all experience of such clouds, in which Cholera cases are found, lead us to believe, what in fact, all experience of this disease else-when illustrates, that in proportion to the sanitary defects of a house, so will be the mortality from Cholera. And there is no doubt, that upon the frequent and close attention paid to scrupulous cleanliness, will depend in all probability the health & comfort of a population. It is hardly necessary to add, that for the preservation & maintenance of health, we must pay due regard to all hygienic measures; for neglect of them, must be attributed the dire results of pestilence. The following Instance,
On the Epidemic of Nepal. By
John Brown, late Presidency Surgeon.
1856.
may be adduced, showing that Want of attention to Cleanliness operates highly, as a Cause of predisposition to epidemic disease. Speaking of the nations of Cadbury, Sir Brown, in reference to the Epidemic of Katmandoo, in Nepal, 1856, remarks, "they are a noble race; ex- tremely clean in their persons; in their houses, although often situated in the densest parts of the city, owing to their cleanliness, a marked contrast to the filth around." "It appeared to me, that these people, living in the midst of the filthiness, yet differing so much in habits from their neighbours, afford some striking peculiarities, in connection with this epidemic; I have not been disappointed. In a table arranging the casualities from Cholera among the people, it is seen, that out of 192 individuals, only 5 died, or 2.60 per cent, while the general mortality of the town amounts at least, double that proportion."

These people then, may be considered to form no ex- ception to the general rule, that good living & clean habits, even in the midst of a plague-stricken city, are powerful preservatives of disease. The dif- ferent rates of mortality, as shown by the Cha- nical Returns, in our own country, tell so far to prove, that we have not yet attained to that
maximum of health, of which our population is sus-
ceptible.

But want of attention to cleanliness, will operate
with as fatal a certainty, now in the better ranks
of society, in an instance recorded by Dr. Christian,
when infection was introduced into a family, in good cir-
cumstances, the miseries of it was slowly. A fatality
in her notices, no fewer than seven children were attacked
in succession, in the course of 6 weeks. It is indeed
almost an established fact, that cleanliness, in
conjunction with other precautions, speedily tends
to check an epidemic; for it is well known, that
fever is communicated to an individual, in the
better walks of society, by constant attendance.
The sick in a Hospital, is very rarely propa-
gated, to those in his own station of life.
Deficient Ventilation as a Cause of Predisposition to Epidemic Disease.

Of all the functions in the animal economy, that of Respiration is pre-eminentl the most important. Then we consider that this function consists, in the interchange of the elementary constituents of the atmosphere, in each act of Inspiration. Inspiration, its importance will become manifest, if the pulmonary organs, constituting as they do, the great scene of the Respiratory Process, demand our constant attention.

It is one of the essential conditions of healthy respiration, that a regular supply of pure air be presented to the lungs; until such a condition be fulfilled, the requisite change in the constitution of the blood, in its passage to, and subsequent exposure to, the pulmonary cells is the action of the inspired air, cannot be affected. Without entering fully into the composition of atmospheric air, it may be remarked, that its normal elements, stand in their relation to each other, about 78 p.c. of Nitrogen, 21 p.c. of Oxygen, nearly 1 p.c. of Carbonic Acid; each is the state in which it is for Respiration. But in Respiration, its composition is considerably altered. Now the inspired air, to possess the same composition, as that it is inhaled, the object of Respiration at an end. But in Inspiration we find, that
The quantity of the Nitrogen remains, much about the same; but nearly 87.2% of the vital air, or Oxygen, has disappeared, and been replaced by an equal amount of Carb. Acid. The separation of Carb. Acid from the venous blood, is absolutely essential to life, cannot take place in an atmosphere containing much CO₂. Hence if the air in Inspiration, contain 10% cent. or upwards, of CO₂, or only 10% cent. of CO₂, the blood does not part with its CO₂, as a consequence death results. This takes place when animals or human beings are forced to breathe the same air, for any continuous length of time; because every respiration, adds to the CO₂, and diminishes the O₂. But even with 1% cent. of CO₂, or 19 or 20% cent. of O₂, depression is felt; the venous blood being no longer converted into arterial, oxygenated, suprarenal. Hence the great importance of Ventilation. One can now fully appreciate the importance of a due supply of fresh air, wherever large bodies of men are congregated together. The air in crowded, ill-ventilated rooms, vitiated by respiration, combustion, soon becomes totally unfit for diffusion; because as the O₂ diminishes, the Carb. Acid is increased. The fatal effects of respiring a highly vitiated atmosphere, have often been made the subject of experiment. If an animal be confined in a glass-jar, full of air, but perfectly airtight, so that all communication with the external...
atmosphere, is precluded, it soon becomes sensible of the deficiency of pure air, for although for a short time, it may experience no inconvenience, yet in proportion as the consumption of air takes place, the respiration of carbonic acid proceeds, so it begins to get uneasy, to pant in each respiration, as if struggling for the admittance of more air; cessation of all its functions, very soon recurs, the animal dies; but this event takes place, more or less readily, according to the quantity of air with it. The animal is surrounded; a bottom-blooded animal dies sooner, the placed in each circumstance, than one of the amphibious or insect tribe. This same result will inevitably follow, the deprivation, or vitiation of air in man, as well as in the lower animals. The copious exhalation of moisture it takes place in respiration, must be a well-known fact; not less known is it, that pulmonary exhalation is one of the chief outlets for the effete matter, from the system; the vitiated air thus expired, not merely consisting in the subtraction of H₂O, the addition of CO₂, but also in the animal effluvia, with which it is loaded, in its passage from the lungs. This last it is that renders a crowded or ill-ventilated room so sickening. In all the above instances, the fatal results are attributed, partly, to what is say exclusively, vitiation of the atmosphere in respiration.
Ballingall's Letters. P. 178
The crisis, may have been generated or disaggregated from other sources; but the deteriorating influence of Respiration, when no possible means of ventilation are at hand, cannot be gainsaid. It is now time to see, receiving that due attention which deservedly demands, from our medical officers in the Navy & Army; the most experienced amongst them, are always foremost in suggesting & most earnestly insinuating, on effective ventilation, as one of the greatest preserves of health, as indispensable, for the recovery of the sick.

Sir J. Ballingall, in his extensive experience in India, recurred to frequently, shows the importance attached to it by Sir J. Rennie, others of equally high authority. Sir John Rennie speaks of Hospitals, being in his day, the cause of much sickness, of frequent deaths, "on account of the bad air." Dr. Jackson insists on "heights of roof, as a property of great importance, in a house appropriated to the reception of the sick of armies," adds as the reason "that the air being contaminated by the breathings of a crowd of people, in a confined space, disease is originated. Mortality is multiplied from extraordinary extent. It was often proved in the history of the late war, that more human life was destroyed by accumulating sick men in low ill-ventilated apartments, than by having them exposed in severe inclement weather, at the side of a hedge, or common dyke." (Ballingall Letter, p. 179)
In this same author, are further recorded, no less pain-
ful than instructive, the evil effects, if I may call it, of
the compactness of the human beings, more than the air of the
apartment can sustain: and the total neglect of any sanita-
tory regulations, in effecting Ventilation. In the summer
of 1871, a low Typhoid fever broke out in the 14th Battalion of the
Royal Engineers, at Scutari. In many instances, violent in-
flammation of the lungs supervened, the result of the disease, was generally fatal. In investigating the circumstances of this fever, it was found that
rooms of 21 ft. by 10 were occupied by 60 men, or that others
21 ft. by 21, were occupied by 70 men. To prevent suffocation
the windows were kept open all night, so that the men
were exposed at once to strong currents of cold air, with
the heated, concentrated, animal effluvia. Necessarily resulting in such crowded apartments, thus subjecting them
to the combined effects of Typhus from Lepthemic in-
flammation. In the less crowded apartments of the same
barrack, no instances of fever occurred. It does appear a
most curious circumstance, that we pay more attention
to the well-being of our domestic animals, than we do to
the constitution of our own bodies. The late Sir John
Sinclair informs us, that to pay an importance did the
ancients attach to exercises in the open air, that the
Roman athletes established their principal school at Capua and Pompeii, repairing the most pure and healthy air in all Italy. That in the training of race-horses, even by some-locked, the most sedulous attention is paid to the purity of the air, in which they live. (Code of Health)

Of the injurious influence of impure or vitiated air. The beneficial results of adequate ventilation, are strikingly demonstrated from the report of one of the meetings of the British Association in Edinburgh. Appeared from an abstract of a Registry, kept in the King's Hospital, Dublin. From 1750 to 1853, it is recorded that in 1781, every sixth child died within a day after birth. Convolvulus disease, that affection of infancy, when ventilation had been adopted, the mortality of infants, in succeeding years, was reduced to nearly 1 in 28.

But taking all classes from together, perhaps no where is the necessity for adequate ventilation more urgent than amongst our manufacturing districts; where from the length of time (varying from 10 to 12 hours a day) during which the operations are exposed to the effects of vitiated impure atmosphere, a great sacrifice of health is being made. Referring to this cause, Mr. Clark mentions the striking fact, that among the lock-keepers of Sheffield, those resident in the country subjected to a more free.
Cyclopedia of Pract. Med. Part XXII. p.32
circulation of air, live on an average, 8 years longer than those resident in towns. In both the irritating cause, the habits of life, are the same, but the hours in at the country continue carry out their labours are longer, much better ventilated. The latter live on an average 40 years, while their town companions are cut off between the ages of 25-82. 

(Cyclopedia of Pract. Med. Part II. 1847. p. 312)

After such striking instances, does it not appear strange that increased measures are not taken for the construction of better buildings, remedying those where an imperfect ventilation exists. Can it be doubted in thus letting our faces right at variance with the fundamental laws of respiration, that the health of many of the community at large, are of the most robust among them, and seriously impaired. Many of might be furnished, all going to show, that the evils arising from an imperfect system of ventilation, by rendering the atmosphere so unfavourable exerting a poisonous influence on all those subjected to such a situation.

Though the idea that the sick only require fresh air, but it apparently, has never occurred to them, that the same means, that are indispensable for the recovery of the sick, are no less advantageous in preserving from sickness, those who are well.
Imperfect System of Drainage & Sewage.

Amongst all the arrangements for the sanitary provision of a populous locality, few are of greater importance, than those which relate to the command of water, whether for domestic or domestic purposes, or for the removal of the corrupting refuse from towns and cities. Unless in fact, a regular system of underground sewage be established, stagnation and putridity of all animal or vegetable matters must ensue; the most delirious effluvia arise; be inhaled by the inhabitants, disease and death be the inevitable consequences. Perhaps by no nation, was underground sewage carried to the greatest perfection, than by the Romans, foremost among whom standing the Sewers & Aqueducts of Rome. So thoroughly was the drainage of the city provided for, that the ground was tunnelled through and with arched passages; the most celebrated of these drains being the Cloaca Maxima, the construction of which is ascribed to Tarquinius Priscus; its ruins still remain at Rome, to attest the fact. A mere glance at the proportions of some of these noble works, may well raise a blush, at the beauty
Sewage substitutes, which we can show, in the 19th Century. The dimensions of our modern drains are insignificant, as compared with those stupendous works: in fact it appears, almost incredible; yet both Strabo & Pliney state, that a cart loaded with hay, could pass down the Cloaca Maxima; & Dion Cassius states that Agrippa performed a sanitary voyage in a boat through the main sewers, when superintending their repair. Some large towns it is true, have their drains & sewers well constructed; but these are far in the minority, the greater number of them that do possess any drain-courses at all, either have them badly constructed, so that they become liable to be choked up, or else they are not situated in the districts most requiring them. It thus becomes incumbent, as I have already stated, on our Corporations & Municipal rulers, to remedy such a system. Owing to improved means of drainage, many diseases have been nearly eradicated. Again for rif. was at one time so prevalent in many parts your island, that our forefathers regarded it as a kind of necessary scouring out, but experience founded on a scientific basis, has shown that by draining the land, thus carrying off impurities,
The same soil may serve for habitation. Thus the Isle of Ely, a marshy district in the East of England, suffered from this cause. It was ascertained that of 10,000 deaths, between the years 1813 & 1830, 920 fewer than 4752, one of children under 10 yrs. age: the proportion of deaths of children under 10, in all the other agricultural districts of England, being only 3505, or about 3 to 4 of the former number.

In like manner the district of Vareggio in Tuscany, was rendered unhealthy by the effect of marsh. Its few miserable inhabitants, are yearly visited by severe agues. In 1741, flood-gates were erected, to keep out the sea; the marsh was dried up, the ague appeared no more. Vareggio subsequently became a populous and healthy district. "Humphry " may be adduced, in confirmation of this same cause of predisposition to epidemic disease. Let us only compare the condition of our shipping, in maritime expeditions, undertaken a century ago, with what it is, at the present day. In the celebrated voyage of Lord Anson round the world, we find many instances given, of the soil effects, if no means of disposing transporting refuse matter. In a voyage to Madeira, thence to the coast of Brazil..."
we find that the crew became remarkably sickly, so that many died. Of great numbers were confined to their hammocks. The Commodore now ordered, "6 air-scuttles to be cut in each ship, to admit more air between the decks." I took other measures to correct the noisome stench on board, & disturbed the vermin, which nuisances had become very loathsome.

"Besides being most intolerably offensive, they were doubtless in some sort, productive of the sickness, under which we had laboured." In other parts it is mentioned, "the distress for being doubtless considerably augmented, by the stench of filthiness, in which they lay; for few could be spared to look after them, which rendered the ship extremely loathsome between decks." Within a year, out of upwards of 1300 men composing the crews of the squadron, she had sailed from England, only 335 remained. I may here quote another instance, showing the great mortality from causes evidently remediable. Vali, the ancientREW capital, is situated about 3 miles to the S. East of Kathmandoo in Nepal. With every natural facility for drainage, it literally pos-
teders none; on one side of the streets generally, but frequently on both sides, their exfilthily gutters,
partially closed in at intervals, but exhaling the most noisome odours. The streets are extremely narrow; the town in many parts in ruins, contains several tanks filled with putrid water; added to this, the town is crowded with pigs. The mortality in this city has been very great; no fewer than 1879 persons dying, out of an estimated population of 70,000; or about 2.6 per cent. And might we not in like manner, draw a similar picture of town defect, in many places at home. The mortality of some of these densely inhabited towns is very great, going on sometimes, at the rate of 4.9 per cent. In like manner, how often do we not observe, drains and cisterns becoming foul; giving off the most noisome fumes, call because no regular system of drainage exists. With regard to the noxious effects of such drains, sewers, government, in co-operation with the Board of Sanitary Commission, should establish a judicious system of drainage, whereby a district might thus become healthy intolerable; this might be entrusted to the supervision, and inspection of the Police.
Decay of Organic Vegetable Matter.

Amongst some of the circumstances which surround us with a vitiated atmosphere I against which we must guard, is the insidious agent, or noxious quality, imparted to the atmosphere in certain districts by stagnant water. I the decay of vegetable matter. It is now an acknowledged fact, that this noxious quality is a subtle poison, acting on the system through the medium of the lungs, produces fever and other epidemics. Our business, however, with it, is to show that individuals or communities, in the immediate vicinity of such aerial poisons, are rendered susceptible to the onset of disease. A striking instance of its acting on a large scale is presented in the Campagna di Roma, the unhealthyness of which is well known, where a large surface is retained in a marshy state. The inhabiting arising from that territory at certain seasons of the year, obliges the inhabitants of the adjacent districts of the city to desert their houses, or take its pernicious influence. In like manner, all marshes, low damp grounds of every kind, produce or least miasmas; it is consequently dangerous to live upon or near them. Tanks, collecting water of every kind, in like manner, are dangerous, beneath or near a house, because, unless their contents be constantly in a state of change, it is rarely the case, their tendency is to send up inhalations of a poisonous kind. Many instances might be adduced, showing
The fatal effects of such miasmatic influences, where families have narrowly escaped with their lives, a removal has caused an almost instantaneous improvement of health, but a return to the same spot has at once renewed the disease. On investigation it has been found that some mild-fool, or old reservoir of water, behind or beneath the dwelling house, has existed, where all kinds of refuse have been thrown, or allowed to discharge themselves. Potholes, matted all kinds, is in fact, almost continuous source of noxious effluvia. The filth that is collected in ill-regulated houses, ill-managed drains, collections of decaying animal substances, and for near private dwellings, these all tend to act as to many causes of predisposition. In this way no doubt, we can account in some measure, for the plagues which devastated European cities, during the Middle Ages. As stated already above, there was no adequate provision for public cleansing. The consequence was, that masses of filth were suffered to accumvlate.

And even in the present day, until adequate supplies of pure water, a thorough system of underground sewerage be adopted, the health and welfare of the inhabitants must suffer.
Intemperance as a Cause of Predisposition. Perhaps all Causes of predisposition. As Epidemic disease. Intemperance is the most destructive, as well as the most insidious. As Intemperance is not merely confined to excess in spirituous potions I shall consider it under 3 different headings. I. Intemperance in eating. II. Intemperance in drinking. III. Personal excesses of every kind. The evil consequences of excess in any of the above mentioned classes, are as generally acknowledged, that they need not be insisted upon here; there is no doubt, that many become, by licentious excesses, prematurely affected.

I. Excess in eating. Perhaps no habit is more debasing or disgusting than gluttony, or excess in eating; not only does it react on the mental faculties, but by predisposing the bodily health, it becomes productive of much destruction to the system. If we see an ordinary attack of diarrhoea, infernus upon a debauch, how much more does the tendency to epidemic disease become increased after repeated debauches, when the system becomes saturated, if I may use the expression, with poison. The consumption therefore, of an immoderate quantity of animal food, cannot but become a cause of predisposition to disease.
Intemperance in drinking. If habits of intemperance in drinking be considered as strong a cause of predisposition to disease, in the mortality of epidemics, intemperance in drinking, may be said to operate with as unequivocal a fatality. In individuals of intemperate habit, disarrangement of the nervous system, as well as especially prevalent cerebral congestion being perhaps reckoned as common a symptom as any; their symptoms consequently become far less amenable to treatment, than in the constitution of the sober temperate; accordingly we find the mortality among drunkards is very great; but at the same time, we take into consideration the influence that dry exercises, we shall find that habits of intemperance in drinking, form as strong a cause of predisposition to disease, as any other; accordingly we find, that the propensity to become affected by epidemic disease is especially prominent in the use of abuse of spirituous liquors; the mortality of course among drunkards, is very great, greater perhaps than the average mortality. The strong and nearly irrevocable propensity to the indiscriminate use of spiritous spirits, raised by our poorer population, as well as by our soldiers & sailors, must be considered as a high cause of predisposition to disease. The deleterious effects of all vitriifying
liquors, it is not my place to dwell upon here. Can the rate of mortality be wondered at from such causes? When we consider that often excess in spiritual exercises, operations, perhaps on an already ruffled and diseased constitution; the young, especially, the immature, are specially liable to sink under such a vice, so often conjured with exposure to a tropical sun. The habitual abstinence of the Spanish soldiers, must be considered, as one of the causes, of the comparatively low rate of mortality it occurred among them, in the West Indies.

III. Sensual Excesses. Under this head, I shall include excesses of every kind; stimulation by drugs, such as opioids; debauchery of all kinds; all causes of debility, exhaustion of the system. Excesses of all kinds, will tell on the most robust constitutions; under this head, therefore, they may be considered, all those causes that jeopardize the sensuous system.
Overcrowding as a Cause of Predisposition. We have already noticed, that an acquaintance with the laws of respiration in the community at large, is a great desideratum, as applicable to the insuring of an adequate efficient system of ventilation; but in like manner, it becomes necessary, that they should be understood, that the direct infringement of any of these laws, in the production of propagation of epidemic disease, is not owing to a divine visitation, but simply to a neglect of the laws of health. The whole history of mankind furnishes numerous instances, where from not paying due attention to these laws, the most dreadful results have taken place. Overcrowding, that is to say, the concourse of large bodies of people, have proved injurious in most places, they may be adduced as instances. The premature celebration of the Jubilee, St. Clement v. called the Faithful to Rome (1350) during the great epidemic, caused a fresh eruption of the plague, from it is said, that scarcely 1 in 100 of the pilgrims escaped. But in many instances, the cause of predisposition may become an exciting cause at the same time. For instance in the Plague of Black Death in desolated Europe, Asia, Africa, in the 14th Century, the number that perished from overcrowding were fearful; no doubt the exciting cause here, was dust from the poisonous breath of those afflicted with the plague. In this
way, the rapidly increasing power of the contagion was accounted for; but in addition to this, it is said that the houses in great cities were not only narrowly built of themselves, but some injurious owing to the exclusion of an adequate supply of atmospheric air; the habitations were filthy in the extreme; I surrounded on every side with stagnant ditches. It has been expressly ascertained, with respect to disease of Paris, that the cleanliness of the streets, increased the plague considerably. In cooperation with other causes, they can be at any loss to account for the seeds of destruction scattered in such hot-beds of filth. In such a justifiable atmosphere, diseases have germinated, with but too fatal a tendency. The general results, then, may be stated to be, that in proportion to the density of population, aggregation of houses in a town, combined with deficient sanitary measures, so is the mortality; that in proportion to the elevation of such towns is the mortality diminished; also that in thinly peopled towns, with the houses apart from each other, especially if elevated, the mortality is trifling. The figures will be comparatively few.
few, terror mental emotions considered as causes of predisposition to epidemic disease.

The intimate connexion that subsists between the mind and body; the reciprocal relations of each other; the mysterious manner in which such connection is communicated; how new impressions affecting the one are propagated to the other, cannot but have been remarked by all; so often indeed, is both the intellectual and physical more disordered, that it becomes difficult in the determination of some maladies, to assign the exact cause, on which they depend. But in some cases, it is very apparent, that specific diseases are produced through the agency of mental impressions, such for instance may be mentioned St. Vitus Dance and other nervous diseases. These mental disorders afford a deep insight into the workings of the human mind; they show how the mind becomes convulsed, by the excitement of the senses, how wonderfully they affect the nervous system. In some cases, they are propagated like a epidemic; in others, it spreads itself sympathetically, dreadful convulsions infecting the frame. Here can in fact, be no doubt, that the passions of emotions, in co-operation with the nervous system, do all act, as so many causes of predisposition to disease.
If the mind becomes depressed by grief, tormented by anxiety, or absorbed in sedentary meditation, all the bodily functions become weakened; the circulation languishes; the breathing becomes slow and scarcely perceptible; digestion is ill-performed; coldness of the extremities ensues.

On the other hand, the mind's nervous system is stimulated by cheerful emotions. Agreeable emotions, a pleasant flow pervades the frame; rational agencies, are much more easily resisted. It has been remarked, for instance, that an army in a high state of confidence and cheerfulness after a victory has a much smaller proportion of sick than in the opposite circumstances, or even in its ordinary condition. Sir J. Ballingall mentions that the actual proportion of sick in a garrison quartered during peace, in a healthy country, is 5 per cent.; but that during a campaign, when there is more anxiety of mind, it is 10 per cent.

In the event of defeat, although the circumstances be otherwise not unfavorable, the proportion rises to a much higher amount. So marked however, are the preservative effects of cheerfulness, the rapidity of success, that in a large detachment of the French Army cantonized in Bavaria, immediately after the Battle of Jena, the proportion of sick was little more than 1 per cent. Then on the other hand, an army is subjected to privations, or is discowi
fitted by defeat, or want of confidence in its chiefs, the proportion of sick is often fearfully increased. (Medical Circular Review No XXXVI. P. 430). We thus see how differently the emotions affect the whole body. Thus we all know, how joy will affect the circulation; grieve the digestion; anger will heat the frame as fervidly as ardent spirits; that fear will chill it as surely as ice. Mental distress completely when long protracted, operating through the medium of the brain, upon the condition of the whole body, effectually undermines the health; depression of mind, besides its immediate effect on the nervous system, changes the respiration, mars the proper operation of circulation of the blood. Evasive agitation takes place in some minds, on the approach of epidemics. Individuals, being so many about themselves succumbing to the epidemic, are panic-struck, with the dread of a fatal result. And I may mention the effects of fear, as causing one of the first symptoms, by which cholera is usually attended, namely diarrhoea. All history furnishes numerous instances, showing the horror of distress, that were entertained by the poorer classes, who supposed that the palaces of princes and nobles were less accessible to epidemic diseases. Churchyards have been found, during the prevalence of a plague, to be unable to contain the dead, consequently it has been
found necessary to contaminate rivers, in order that bodies might be thrown in. In populous cities, the most extraordinary measures have been adopted, in order to defray the expense of disposing of the dead; as is quite possible, in such a state of affairs, where indecent haste and alarm prevailed, making some prevalent, that plague patients were buried alive; thus, of course, the honor of the distressed was greatly augmented. Nay, indeed, in some cities, it was prohibited to publish the number of the dead, or to toll the bells, at their funerals, that the living might not abandon themselves to despair; for, of course, the most ordinary precautions, must have been overlooked, if individuals have thus become, more susceptible of the attacks of fear. In many instances have occurred, in the visitations of pest epidemics, such as that of 1331, in Russia, where similar modes of burial, the same terror, certainty of death, have produced a terror, depression of spirits, highly calculated to renovate the system, thus restoring one of the best ways to the onset of disease. But the influence of such fear is not only expected upon those in the same rank or country. The wealthy abandoned their treasure, gave up their villages, estates to the Churches or Monasteries; these in their turn were devoted, being benefit of their priests; thus the expenses of the priesthood, in particular, operated very detrimentally upon the people.
the lower orders of whom were naturally most exposed to the ravages of the plague, those temporal as well as spiritual interests constituted their especial charge. The mental shock thus sustained was unparalleled; in the eyes of the timorous, danger itself was regarded, as a sure harbinger of death. Many examples have occurred in the history of epidemics, to all go to show, that fear operated as a cause of pre-disposition; many falling victims to fear, on the very first appearance of the distemper; the bravest losing confidence. Superadded, then, to fear, terror, mental distress, may be mentioned all the numerous predisposing causes of anxiety; privations & trials of all kinds; irritability; depression of mind; & in addition to these as some of the causes of predisposition to epidemics, all history bears us out, in the relation of sieges & sudden panics, all depressing agencies must present themselves to the minds of all thus situated, that is, to those who are surrounded as it were cut off, from all communication with the outer world; for doubtless there are liens, when the most stout-hearted must despair. All reasons of scarcity, public distress, diminution of employment for the working classes; all speculative manias, these must rank I all been considered as the certain harbinger of epidemic visitation. As a consequence resulting from this, all
Succers of depression & exhaustion, physical & mental, must be carefully avoided, if the more so, by those who are in constant attendance, or come much in contact with fever patients. It is thus a legitimate deduction, that fear, fatigue, excess together with other debilitating powers may co-exist with some of the abovementioned causes of predisposition, such as the congregating or aggregating of the poor, in close social dwellings, to expose the system, against the sudden invasion of acute epidemic disease. Can all measures for sanitation thus appear visionary? Surely it becomes a duty, incumbent on a British Senate, to enforce the adoption of all sanitary & hygienic regulations. If the prudent, adopting such measures be found availing, during a pestilential visitation, either in lessening the mortality or mitigating the disease, why not equally preventive measures be established, as the constant & habitual means of the preservation of our population.
Section II.

Uncertained Causes of Predisposition to Epidemic Disease.

Having in the preceding section, taken a rapid glance at those causes of Predisposition to Epidemic Disease, all are sufficiently well ascertained; I having also noticed how often they act in concert with each other, in rendering our systems susceptible of the attacking disease. I pass on now to a consideration of the next section. The Uncertained Causes of Predisposition to Epidemic Disease.

Here a new field opens for our investigation; it is one of thought involving far more difficulty, is certainly not less interesting than the former. Some of the causes that we have already enumerated are sufficiently comprehensible and palpable; but there is no doubt, that occasionally epidemics also occur, when these co-operating circumstances are quite incomprehensible. If the development of our takes place as rapidly as does even when all appreciable causes are believed to promote the extinction of an epidemica may be ranging; still the infection proceeds. It increases instead of diminishing. Hence we are reduced to the necessity of inferring the existence of some hidden cause; finding our views...
reduced to so narrow a compass, we are compelled in our endeavours to explain the facts to acknowledge the existence of some unknown powers; in our utter ignorance attribute them to the atmosphere. Indeed hardly allude in passing to the influence of the heavenly bodies upon our planet, as being the cause of epidemic disease; these actual influences, together with the so-called philosophical system of alchemy, magic, we must consider to have been long since consigned to oblivion. But for a long time back it had been the fashion to attribute the causes of epidemics to some atmospheric influence; whether this consist in some difference in its constitution contrary to its known physical properties, or that it is owing to a particular combination of these unknown properties, it is difficult to state. This then constitutes the grand problem in our subject; the one, the solution of it is most desirable; but at present the data are too few, indeed appear to have so little apparent connection that we dare not venture to generalize them, into any thing like a theory. Yet notwithstanding there is great encouragement to the study of this department of natural science. The full
investigation of these causes, not only embraces many topics, all of an interesting character, I soon found brought with difficulty, but it is the main subject of a number of sciences, each of which demands the constant labours of a large section of intelligent devoted men, in order to obtain, even moderate success, in its prosecution. Our enquiries, however, must be confined to those unascertained causes of predisposition, or liability to epidemic disease.

In attempting to draw upon any such inquiry, concerning the unascertained causes of predisposition to epidemic disease, we shall find, that many difficulties inseparable from the nature of such investigations, those referable to atmospheric contamination, or atmospheric origin, are the most formidable. The immense extent of diffusion from epidemics, necessarily calls upon us, to view them in a larger and more comprehensive light, because such inquiries lead us to an insight into the organism or economy of the material universe, where the whole of organic life is subject to the great power of nature. Our knowledge as yet, has not sufficiently advanced, to admit your tracing, what connection may exist, between the processes at once above, those that are conducted below the surface your globe; or soon to
Hippocrates. De Flatibus Epidemicis
Commentariis Galeni.
explore what natural laws, may be in operation, in causing such phenomena. Still less so, how far these may concern the production or propagation of epidemics. But there is no doubt of the fact, that the forms of pestilence may be vivified by atmospheric physical determinations and corrections.

No doubt, in many cases, these causes must be attributed to some latent atmospheric element. In retrenching upon the field of the illusory, ascribed causes of predisposition to epidemic disease, considering their origin to be aerial, it is more satisfactory, in the first instance, to make few observations upon the physical constitution of the atmosphere. From very early times, it has been the fashion to attribute the causes of epidemics to the atmosphere. Thus Hippocrates (in his Epidemicae Commemorantibus) states that diseases in general may be said to arise, either from the food we eat, or the air we breathe. When therefore a disease seizes on a multitude of persons, of different ages, sexes, habits, he justly infers that it must arise from the latter cause. It is reported of Hippocrates, that like Alcman or Apelleianus, he changed the morbific state of the atmosphere at Athens, by kindling fires (Galen, Therap. et Pis. Etius. v. 74). The historian Herodias, relates that gymnastics with aromatics were recommended as a
preventing the Plague. The necessity, therefore, of an examination of the physical constitution of the atmosphere becomes apparent. When we consider that these are diseases peculiar to every country, it is evident that occasioned by the influence of the atmosphere, or by similar causes, it occasionally occurs, seemingly common to mankind in general, have been supposed to be propagated by the immediate influence of this fluid, in consequence of an alteration of its natural qualities, or its being mixed with certain matters, possessed of peculiar properties.

The workings of the atmosphere, in the economy of development, of both the animal and vegetable kingdoms is greater than might at first sight be supposed. When we consider that the growth of plants, the life of animals, cannot be fully developed, or even exist, without the presence of atmospheric air; and that the most delicately organized being is capable of obtaining from the atmosphere, without any effort on its part, the requisite portion of its component constituents, in taking in its ordinary atmospheric supply, can the investigation of substances it thus ministers to the most gentle, as well as to the most gigantic calls of nature, fail in interesting factuating us, in an enquiring, as to its nature? constituting? How much more then, does the study of the
atmosphere becomes in an considerable degree, the most interesting of any, if it furnishes us with any thing like a clue, to the causes of fever & pestilence.

The first subject then, that I propose to consider, is the influence of the atmosphere, indirectly regulating epidemic diseases, noticing. Paying attention to the nature of those matters, it is perceived that have the same power. In this way then, I propose dividing our subject into sectional divisions.

I. Physical Influences   II. Seasonal Influences
   b. Electricity.     IV. Topographical.

IV. Humidity. The atmosphere is a compound fluid which must be liable to great variations in its different constituents. The most variable of all its ingredients, is the quantity of vapour water, the variations in this respect, furnish us with some of the most interesting phenomena of the atmosphere. The chief causes of these variations, are changes of temperature, & pressure; but these appear to be modified by changes of action, between the different substances composing the atmosphere, between different parts of the compound. The effect of these atmos
sphere changes: to depend upon differences of heat or pressure are very important. The natural temperature of the atmosphere is now so high as to change water into vapour by absolute boiling, but water has a tendency to pass into vapour at all temperatures, even at those as are far lower than that at which it freezes. This tendency of water increases as the pressure upon its surface is diminished. In consequence of this, water is the only component part of the atmosphere, it can be dispersed through the mass, in elastic vapour, can be withdrawn from it, in a liquid state, without chemical combination with any other substance. This is an important property of many of the phenomena of the weather. Of the degree of fertility and natural value, in countries as depending upon the weather, are the consequences of it. This humid state of the atmosphere, by rendering the nervous system, producing a state of nervous relaxation. Thus revivifying the physical strength, may operate as a cause of predisposition to disease. By means of barometrical measurements, we ascertain what the pressure of the atmosphere might be at any place, and thereby, possess of one important element of the vigour of atmospheric action at that place. This is one of our main guides to its fertility. In like manner, we should be made acquainted, whether such
a state the atmosphere might not, yet occurred, during the autumnal Equinox, becomes coalescence, with the alternation of intense heat and coolness causing great discomfort. As soon as the onset of epidemic disease, with a dry atmosphere, becomes endure a degree of cold, it is scarcely tolerable if the air is charged with moisture, for the simple reason, that the dry air can not carry away the caloric from the body, as the moist air can, while on the same principle, we can bear a higher temperature in dry weather, than when the air is in a moist condition. That some epidemics are more plentifully dispersed in humid, not in dry state of the air, is well established. During the awful prevalence of the epidemic in Kurrachee "the quantity of rain it fell, was much beyond anything that had occurred for a long time before." The Report of the Board of Health says, "Upon the whole, the general result of observation of experience is, that the natural physical condition of the air, is the most conducive to the propagation of cholera, in a hot, moist, stagnant atmosphere. The central parts of India, are the most subject to the epidemics, because of the more constant occurrence of the S. West Monsoon, or Sea-Breeze of the hot months. (It is a hot wind, saturated with
moisture" to refer to these atmospheric causes or conditions, as existing or essential, in the development of epidemics. Whatever may be the essential essence of cholera it is rendered certain, that it is grown less, in pure natural atmosphere, into a richly impregnated, from decayed organic life; hence the air is not devoid. Deficiency, or excess of humidity, may be productive of disease. Thus the year 1714, was extremely unhealthy, evidently from want of a due proportion of humidity in the air.

In connection with this humidity of the air, I may mention another adulteration of a monodendric character. It is occasionally infused into the atmosphere, increases to an enormous extent, fills the air with haze. The phenomenon I allude to, is called "Ty'fog" to distinguish it from the ordinary humid mist, called Tyf. The vast space between Lapland and Africa, was inundated cow, during the years 1782 and 1783, with a dry fog, unequalled in intensity. It was in the form of a pale blue haze, I was to think at noontide, that the sun looked through blood-red colour through it. It was not affected by rain, it suffused alike our countries like our own.

"distempered climate" others when the air is usually clear. Voyaging was dangerous, even in the
Mediterranean by reason of its being just as thick as the summit of the highest Alps. Its properties are peculiar. It was said to have a strong disagreeable smell. In some places a viscid aerial liquid is said to have been deposited by it. The pestilence alarms prevailed; men's hearts failed them for fear. Public prayers were earnestly made to avert the apparently impending doom of all Europe. Aful Hæmolyticus visited the Continent. Desolated France. I destroyed a large number of human beings. Cavalry in England. It was a time of the greatest horror. The London of 1703 was at length its termination. Violent electric phenomena, with storms of wind, rain, and disorder, before the autumn, all was gone; the plague was removed. During the whole period that it lasted, a severe epidemic entered something in all probability similar to influenza, affected many animals. These remarkable years, 1792 (1793), were singular as regards "dry-joys". Principally in the enormous extent of its distribution, a circumstance quite unparalleled in history. Dry-joys, however, a local, or more limited extent had been known before. Tissien relates that "the Influenza of the spring of 1783 appeared in France, immediately after offensive joys, more intense..."
than the darkness of Egypt." In the autumn of 1775 in Russia, influenza appeared with violence and was extended by thick noisome fogs, having been preceded by disease among the lower animals.

B. Electricity.

As the atmosphere contains a large amount of electricity, it plays in various ways an important part toward both organic life (inorganic matter, as the whole animal and of world, are greatly influenced by this electricity), so we have no doubt that it is intimately connected with their life and well-being. But what exact share the electric state of the atmosphere may have, in being considered, as cause of predisposition to epidemics, is one difficult to state; the few facts that are known are often contradictory. catchy insufficient character. I may just mention a few facts, in illustration. Cholera has been regarded by some as a disease, due to deficiency in the amount of the electricity of the air. Some curious statements have been made on this point. At St. Petersburg, it was found that a large magnet had wholly lost its power, so long as cholera ravaged the city; but as the disease took its departure, the magnet gradually recovered its sustaining effect, when the disease had entirely gone.
It was as strong as before. It has also been noticed, that the electric telegraph refused to act, during its prevalence. But the following is a still more remarkable fact. In a letter addressed by Mr. Audraud, to the President of the Academy of Sciences (France), it was found that a powerful electric machine, used in his observations, was capable at ordinary times, of giving out sparks in profusion, or being gently set into action. But, writes Mr. Audraud, "from the time the epidemic began, I was no longer able, on any single occasion, to produce a corresponding effect. During the months of April and May (1849), sparks only appeared, after violent action. These fluctuations were then observed to coincide most exactly with the fluctuations of the horizon. Nevertheless, I was afraid, lest the irregularities of the electric machine, which were occasioned by the hypnotic state of the atmosphere, would cause the whirlwind to recur, and to continue my observations; but far from the previous indications of the machine showing any signs of diminution, they only became stronger; for although the raised weather, an augmentation of electricity might have been expected in a few days, the signs of pressure ceased altogether. On the 4th, 5th, 6th of June, it was only
possibly to obtain a slight excitation. On the 7th, the machine became dumb. This singular decrease in the electric current, fortunately accorded with a concomitant increase of the Chelus. On the 8th, sparks re-appeared, increased in number & intensity. In the course of the day, a thunderstorm announced to plague-stricken Paris that electricity had once more entered in its dominion. On the 9th, at the slightest touch, it gave forth sparks in abundance. Meanwhile the Chelus, was rapidly subsiding.

During the start of this same year (1849) Mr. Quétellet was proved by careful observation, that the electrical intensity of the atmosphere had been about one-half that observed in former years. But from Feb in this year it regularly diminished up to a certain period, then it continued stationary. The following is Mr. Quétellet's table of the mean electrical intensity of the air, for the years from 1844 to 1848, both inclusive. Of the means of the same months in the present year.

<table>
<thead>
<tr>
<th>Year</th>
<th>Jan.</th>
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<th>March</th>
<th>April</th>
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<tr>
<td>1844-1848</td>
<td>53°</td>
<td>45°</td>
<td>58°</td>
<td>39°</td>
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<td>18°</td>
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<td>1849</td>
<td>39°</td>
<td>56°</td>
<td>21°</td>
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1844 - 1848 1849.
July 19° ......... 14°
Sept. 21° ......... 21°
Sept. 24° ......... 24°

Other scientific observers have detected the same peculiarities. We are still unable to state that a deficiency in the electric intensity of the atmosphere can be the cause of the cholera; it must be considered, as an accompaniment of the phenomenon, to produce cholera; if it may be that in operation with some of the well-known exciting causes of ordinary fever, it may so lay the system open to the invasion of disease.Difficulties indicate these, as the whole question is, this general fact appears to flow from the preceding observations; that what can be the cause of cholera, check-like epidemics, supposed to be of animal origin, the causes of some of the common distempers, belonging to this class, are plainly discernible, in the putrefying filth, it is allowed to accumulate, by our poor brethren, round their dwellings. Indeed, indeed in the whole range of medicine, can be more confidently affirmed, than that filth and dew stand in the relation to each other.
because I effect. It may be objected, that if the effect are not likely to be found in the mansions of the rich. If however, under the sections Acentrical Causes of Predisposition to Epidemic Disease, there given a whole catalogue of causes, I can remove the system, the rich & the noble, and they reflect the sanitary & physical condition of their own households, as well as the poor, in their immediate neighborhood, will not escape unscathed.

Still we are left in the dark, as to what these peculiar electrical states of the atmosphere may have in speaking as a Cause of Predisposition. And the only way it appears to me, is that if we may imagine may take place, after the application of an ordinary exciting cause. We all know, that after any artificial excitement, a corresponding fit of depression ensues; now then, it has appeared to me, that when the atmosphere becomes highly charged with electricity, an unnatural excitement is produced in the body, a state of high nervous tension ensues; for the time being increased, capable of undergoing greater fatigue; but this artificial excitement is succeeded
by a period of depression; this specifically, operating as a weakening cause, may thus become another cause of Predisposition to Epidemic Disease. It is not to be supposed, that any one of these circumstances alone, can be said to be the cause of any Epidemic. What occurs, but too often, is cooperation, may certainly act, as so many Causes of Predisposition to Epidemic Disease.

Ozone.

Before dismissing the subject, I cannot omit the consideration, of one of the most remarkable discoveries of late years upon the accidental ingredients of the atmosphere. This is in connection with a substance, termed by Prof. Schönbein, Ozone. Some connection between the presence of ozone in the air and the existence of epidemic diseases, such as the Influenza, has been imagined. Mr. E. Hunt, in a communication to the Athenæum Paper, observes of ozone, "Ozone is constantly produced in the atmosphere, under some circumstances of disturbances, either electrical or chemical changes; its amount appears to vary in an exact ratio, with the electrical condition of the air. The use of this agent in the atmosphere,
will I think be obvious, after a very brief consideration of the conditions to prevail during the mutations of organized bodies. All living animals &c. are constantly throwing off from their bodies, organized matter in a condition the most fitted for recombination with the chemical elements of the air. The p新京 stopping from all dead matter are also constantly combined with organic particles, in a state of intense division. Thus the atmosphere is constantly receiving, exhalation from the earth & its inhabitants. It without a provision for their removal, rapidly becomes, far more injurious to all forms of life than carb. acid. Ozone combines with carb. acid in the most rapid manner with all animal matter, except albumen, in its fresh state. I am therefore disposed to consider it as the great natural agent, employed to convert all these deleterious exhalation. If the air receives into innocuous matter. An atmosphere, artificially charged with ozone, immediately derives the most pungent solid or fluid bodies, of all disagreeable smell; sulphuric acid. Hydrogen is instantly decomposed by it. It has been proved, that the electrical citrate of the atmosphere, has during the year 1849 been diminished in a remarkable manner. If this
is the great cause, now active in producing Ozone, & might a priori infer a relatively diminished quantity of this chemical agent. Experiment has proved, that during the last 3 months (June, July, Augt 1849) an appreciable quantity of Ozone, could not be detected by the ordinary methods in the air of London. Certain it is, that we have for several months, had to endure an atmosphere of low electrical intensity, deficient in Ozone, an agent which removes or alters putrefactive miasma. Each time that Cholera has disappeared from amongst us, it has been rapidly followed by Influenza. At the meeting of the British Association at Swansea, Dr. Moffat communicated the remarkable fact, that the prevalence of Influenza, the spread of epidemic affections, was invariably connected with an excess of Ozone in the atmosphere.

From these considerations it may be gathered, that upon this theory, the presence of Cholera is connected with the absence or deficiency of Ozone, while the presence of Influenza or epidemic Catarh, is due to the excessive presence of Ozone in the air. Also that a certain amount of Ozone is necessary in order to sustain the active salubrity of the atmosphere, in consequence of its promoting the
property of destroying various occasional ingredients in the air. Still we cannot consider these statements at present, to be more than hypothetical

Temperature.

Although the subject of temperature belongs properly speaking to the department of contained causes of predisposition to epidemic disease, yet as it embraces Moisture, Winds, Barometric pressure, or any appreciable atmospheric condition, these therefore left its consideration for the present place. Very high and very low degrees of atmospheric pressure are said to produce similar effects on animals, as well as plants; there is no doubt that the health of man is most certainly injured by sudden alterations of temperature; it may be said, that it is principally owing to the stimulating or debilitating effects of the higher or low temperature of a climate, that endemic chronic complaints are generally occasioned. But a high deposit in the atmosphere, over a situation where there is a considerable extent of stagnant water, especially if it abounds with the putrefying remains of animal or vegetable matter, always produces acute diseases of the most malignant
nant description, as Intermittent, Remittent
from, as well as Typhus, in all its varieties.
The temperature of the air operates in different
from poisons, principally as they affect its
as a carrier. This is shown in the cholera
poison. At great elevations, the rarity of the at-
mosphere, loses its power as a vehicle, for the
transmission of the miasmata, by which it is
produced, as is illustrated by the fact, that they
have never been carried over the Alps, or the
Himalayas. The carrying power of the atmo-
sphere, is materially affected by its hygroscopic
condition. Intensities of heat & cold, both act as to
many causes of predisposition to epidemic disease.
Heat is perhaps the most universal stimulus, with
which we are acquainted: when applied in any great de-
gree to the body it excites the action of the nervous system
in general, of the cutaneous nerves especially. We are most
exposed to its influence, & render them more susceptible of
any impression. It is well known, that the prevalence
of diarrheas in this country, is for the most part, the
result of unusually warm weather: sudden transitions
from heat to cold, are equally productive of disease.
Cold is particularly dangerous when accompanied
with moisture; a man will be seized with diarrhoea by sitting down without changing his clothes, after being drenched in rain; sleeping in a damp room will also produce this effect. From this cause, we find the inhabitants of low wet countries frequently subject to diarrhoea or dysentery. These return of heat or cold are naturally so connected with the season of the year, that I shall reserve their consideration until treating of Seasonal influences.
II. Seasonal Influences.

In mentioning season, as one of the causes of predisposition to epidemic disease, there is no doubt of the actual fact of the case. Why it is so, it is difficult to speculate an influence upon the body as to render it unusually susceptible of the attacks of disease, is more than we are able, in the present state of our knowledge, to assert. There is no doubt, however, that the different seasons of the year do affect the health of individuals or communities, more or less.

It appears to be one of the great laws of nature, that all developments in the natural world do not proceed in a system of graduation; we find the year divided into the 4 periods of Spring, Summer, Autumn, Winter. We find the circle of the seasons, as we trace them in succession, revolving after each other, with the utmost regularity; so in estimating the influence that season exercises in predisposing the system to the attacks of epidemic disease, it appears more consistent, in order to bear the analogy fully out, that we refer to the individual periods of Spring, Summer, Autumn, Winter, in their successive order. After considering what natural principles or grounds, may have prompted to the earliest change of the subject before us, we...
leading the growth and development of an ordinary household plant, we all observe that numerous, powerful, and invisible agencies are at work, differently affecting it at different seasons of the year. Let me illustrate my meaning by following up the life of a plant for a single year. We observe that in the Spring, when return of heat and cold prevail, it is exposed to great dangers. In the Spring, when as in the Autumn, there exists such a rapid transition from the cold to the warm air, the cold to the forming dew is owing, becomes so intense, as to convert that dew into little spicula or needles of ice forming what we usually term "hoar-frost." Though these little solid globules of ice are often exceedingly minute, they are highly injurious to the young tender leaves and buds of seasonal plants; more especially, if as is generally the case, they are followed by a warm sunny morning, these spicula melt the ice and consequently chills those leaves and buds, by the withdrawal of that heat from them. It is essential to the right performance of their functions, hence to their life.

As Summer is the season when all the plant's primary principles of motions of nature are in perfect activity; as it is the season, when the play of circulation of
Electricity is at its highest point, and consequently the atmosphere becomes surcharged with the electric fluid; as the greatest heat, the greatest light prevails. We may expect the greatest amount of racemes & c. in summer. Then the plant is exposed, to the intensity of the solar rays & to all the influence of the elements.

In Autumn. The fall of the leaf is the distinguishing feature of character of autumn; as in the spring the first alternations of cold heat; the weather becomes more unsettled. Where once there are violent alternations of rain & drought, the former brings a luxuriant vegetation upon the surface, but the latter consumes it away so that the herbaceous plants are deprived of their greenness, & the ligneous shrubs, in part, devided of their leaves.

In Winter. Here again, the plant is once more exposed to the nipping frost of the icy winter; although it may avoid the keen blast of spring, still the very intensity of the cold is often more fatal to it. I see comparing them to the life & development of an ordinary house-hold plant; to the development of growth. Human is not the analogy fully borne out in some parts. It then the life of a plant more sensitive & delicate, than that of the human body. Let us look.
into the poorest cottage home, is often so hard to find, that the most delicate plant is more often tended with a fostering, patient care, than is bestowed on his children, whose constitutions may be equally delicate. If then the plant is susceptible of cultivation, under a fostering care, are not our constitutions infinitely more susceptible of becoming more hardened to vigorous.

That a certain relation exists between the seasons, the intensity of epidemics, there can scarcely be a doubt. For in cholera raged with great violence in the winter, at St. Petersburg; also in Scotland, it existed during a sharp frost in June. The mortality from fever is somewhat influenced by season, the autumn and winter quarters being the most unfavourable. In the northern counties of England, the deaths are very much fewer in proportion, than throughout the remainder of the country; the largest mortality occurs in the western counties.

Cholera is a bowel affection, at their maximum prevalence destructive, at unhealthy seasons of the year. But it is perhaps in the hot weather, that disease is most fatal, when the electric tension of the atmosphere is greatest, as
instance, in the production of heat. At other times, during the heat of summer, the body becomes greatly exposed to the highly stimulating effects of the sun's rays. By the evaporation on the surface of the body, one is kept in a state of high excitation. But once this stimulus is withdrawn, by the radiation of the hot weather, one soon afterwards, cold and moisture, exert their influence with great intensity. Thus, if the body be exposed by night, as well as by day, to the heavy rains of almost immediately follow the greatest degree of summer heat, we may account for the great prevalence of diarrhœa and dysentery. Dysentery however, seldom appears, but in situations where idiosyncratic fever prevails, I think it frequently changes into that disease; but it is more particularly to our purpose to notice, that during the hot season of the year, in such situations as are most frequently enveloped in a moist atmosphere, not sufficiently well aërated upon by the sun, to produce fever in a bad form, dysentery is produced. Continued to prevail, during the continuance of such circumstances. The blearing of the bowels of persons those streams is not rapid, when chills and vapors of mists arise, are situations very productive of this disease.
Climatological Influences.

The effects of climate, as affecting the health of a community, must be too well known to demand any special attention on this point; although in estimating its effects, temperature, including all atmospheric changes, barometric, together with the influence of season and geographical position, ought to be taken into consideration. There is no doubt that climate has a great effect on some diseases; we are well aware, that there are diseases peculiar to certain climates, that these vary in every country, according to local situations, season of the year, under this category, come the great group of endemic diseases, a few of which may be mentioned. Thus we have the endemic Remittent Fever so frequent about Alexandria, as well as many other sea-port towns on the Syrian coast; the endemic Yellow Fever of the West Indies; not to speak of the Elephantiasis of Malabar; the Goiter of the Alps; Plague in Poland; Cutaneous in the Palais; Malara in the Campania di Roma. It remains for us, now to observe, how far different epidemics, have been affected by climate: now as it is very tedious to go over, varieties, different epidemic diseases, I shall give you one or a type, namely Cholera. The ci-
flavours of climate, may be regarded in a two-fold manner; first as regards the external characteristics of race; secondly, as affecting the mental faculties. It is a fact too well known, to require further notice here, that the mental and corporeal faculties of man vary according to climate; that the mental and physical powers, arrive at their acme, are much sooner developed, in those inhabiting a temperate climate, than in those living in a hot one, where the natural powers are considerably retarded. Old age and decay come on much earlier. Thus in some countries, the female sex is found to be marriable at 10 years of age, in some individuals at 8 or 9, but this premature state of the faculties is always followed by corresponding quickness of decay. These women appearing old, becoming frail mothers, by the time they have reached, little more than their 25th year. In like manner, the mental faculties undergo as remarkable changes. The influence of different states of atmospheric temperature, upon the passions, has been remarked by the very earliest writers. Even the changes of seasons, every incidental variation of weather, have a striking effect, upon the mental faculties of every one. There is not a more common observation, than to hear of the effects of different
state of the atmosphere upon the spirits. There cannot be a doubt, that changes from a rare to a more dense state of the atmosphere will have a proportionate effect, in varying the degree of pressure upon the surface of the body. It will thereby induce corresponding effects upon the state of the mind. From all this we may suppose, that when an epidemic visitation takes place, it will operate with increased vigour, on the constitution of those thus predisposed or unaffected; the warmer temperature of a climate, renovates the energies of the body, as well as the mind. That the faculties of the mind become enfeebled, degraded, in proportion to those causes (be they climatical or otherwise) which affect the activity of the body, there cannot be a doubt.

Let us only refer to the ancient inhabitants of Italy or Greece. Here we find a genial climate, admirably suited to have furnished the models of everything, calculated to raise the intellectual standard of man; the country, where as in a nursery, the physical and intellectual faculties of man, arrive at their highest perfection. They have left us in their writings, models of elegance and diction. Yet such a tyrannical hold, have their national institutions over them, that their social, religious and political systems of their inhabitants, are rather calculated to depress the vigour of the mind.
Grows to debilitate, the reasoning faculties. We therefore find that in those climates, where formerly peopled by men of the most enterprising and active dispositions, their present inhabitants seem to have sunk into the most deplorable state of inactivity. Mental vileness.

A complete elucidation of all the circumstances connected with climatrical influences as affecting epidemical diseases, to require a tedious historical investigation of the subject, at the limits of my Thesis, does not permit. It will suffice to say, that there have been considerable variations. Italy for it is found to be much warmer than it seems to have been, in the time of the first Roman Emperors; the winters in the South of Europe, were then much more severe, according to the concurrent testimony from authors. Diodorus Siculus mentions, that the rivers in Germany, Gaul, as the Danube & Rhine, were always frozen during Winter; that it was found necessary to cover the ice with straw, in order to make the passage over them secure. More probably, during the most severe winter, that has occurred during last century (1795) there was no river of any consequence frozen over, even in the northern parts of France. One may suffice. Pliny the Younger had a country house in Tuscany.
where neither olive, fig tree, nor any sort of plant at
requires a warm climate. We raised but it is found that
in this situation, all these fruits come to the greatest per-
faction by the ordinary temperature of the climate of the
present day. Have before alluded to the fact, that there
are certain diseases peculiar to certain climates, that
these diseases vary in every country, according to local
situation & season of the year. Thus we find that the
serpentine eruptions to be found prevalent during
summer, autumn in temperate climates, correspond
in the cutaneous diseases of febrile complaints, to com-
mon in warm countries at all times. The effect
of climate in reducing or aggravating pestilential
disease, is sufficiently well proved by the unhealthi-
ness of swamps or malodorous districts, compared to the
salubrity of a climate, at a greater elevation. The
question seems to be, does climate affect the march
of any epidemic - if so how. This is a question not
admitting of very easy solution. Cholera for e.g,
seems to have spread just as fatally in warm climate.
But the effects of climate on epidemic diseases
remain the very ridiculous. When a climate is dry
and infecting, it produces in various diseases,
much apparent fever; & thus it apt to deceive
persons who did not thoroughly take all the circumstances into consideration, supposing that they were treating inflammatory disease, after depletion, they would find the patient rapidly sinking into the typhoid state, from which they did not rouse them. Excitement is always followed by depression; and in these cases, excitement is excitement of irritability, nervous excitement rather than vascular of asthma, rather than asthma. Therefore it is necessary to use caution in the administration of antispasmodics.
Topographical Influences.

(a) Terrestrial locality. For the general sanitary condition of a population, their health, efficiency, expectation of life, numerous localizing causes or agencies, must be taken into consideration. If one of a situation happens to be in a malarious district, dangerous consequences must arise. Examples of unhealthy situations, owing to delirious exhalation, may be adduced in the Campagna di Roma, several places in the vicinity of Naples.

It is a fact popularly admitted, that low damp situations are unfavorable to health; that in the generality of cases, there is nothing like the fresh mountain air to revive and restore the invalid.

Discoveries have recently been made, as to the influence of elevation, in carrying man beyond the reach of the choleraic poison, harmonize perfectly with this natural preference for elevated spots, when man is in the pursuit of health, or anxious for its preservation. We know that the Asiatic cholera, originated in the low marshy, swampy tracts of country. It forms the Delta of the Ganges. In the history of its progress, constant notice was given, its development in low marshy plains.
along the course of rivers; but only up to a certain level, it also by the sea-side, in places where deltas were formed, into masses of impurity were being continually carried down. The notice in the report of the Board of Health, frequently speak in this manner: "Still maintaining a N. West course, it arrived coast-said at Decade, where it first broke out at the sea-coast. Gradually it extended upward to the desert; then taking into Syria, it spread to Damascus; in a few days, reached Aleppo. In the following month, it extended its ravages over the whole of the Upper Tigris, and towards Diarbekr. There certainly therefore, exists a close constant relationship between epidemics and elevation. The tables of mortality in England show, that as a general rule, the mortality declines, as we ascend rivers; that the majority of healthy districts, are at certain elevations above the sea. The development of Cholera, we have so far seen, is affected by terrestrial locality and topography. But how come it, that in any given year, certain places are visited, whilst others escape? Why do those escape one year, be visited subsequently? Why is the average mortality from any one of the following diseases
Measles, Small-Pox, &c., so much larger in one district than another. Fever is more prevalent in agricultural districts, than in towns. This arises from the labours generally living in huts, with mud floors, the exhalations from which are most prejudicial to health. The agricultural labourer also experiences the great disadvantage of an inadequate supply of pure water; it is too generally obtained from neighbouring huts or small rivers, &c., which often become the sepulchre of the inhabitants. The improvement of obtaining good ground for healthy situations, richer for agricultural use, or for an encampment, or for an anchorage, cannot be too highly estimated; in the selecting a suitable encampment ground, dry situations preferred. The chosen, sufficiently removed from the influence of swamps, pools of stagnant water, still alive in like manner, should avoid anchoring for the night near marshy or swampy ground, or under a high bank, or dense bushes, thus preventing free ventilation. Geographical position, together with density of population, each exercise a very decided influence over the mortality of epidemic diseases. I cannot close these observations, on
Sanitary arrangements, without referring to the objectionable mode of interment, too often practiced in our large towns, that of enbalmment in vaults; what we want is, interment in extra-mural cemeteries.
Part IV.
Answer to Objections.
In answer to some of the objections, it may have offered themselves in the discussion of some of the uncontrolled causes of predisposition to epidemic diseases, viewed in reference to their origin from the atmosphere; it must now be borne in mind, that the subject is beset with difficulties. One of the chief reasons is, the vast number of elements, that have each to be studied, taken into account, the different laws, at each of them obey, in many cases their indeterminate nature (constitution) the modifying influences and the modifying influences at they exert upon each other. We find it a matter of no small difficulty, to state in ordinary language, what are the causes of the weather: where to take into consideration, the daily, seasonal, motions of our planet; the action of the sun of moon; the reciprocating influences of the hemisphere; those of the sea, those of the land; of mountain, valley; of the surfaces on our earth, covered with a different vegetation; all these varying causes, we must take into account, yet so much are they blended, intermingled with each other, that it becomes almost impossible, if we attempt to analyze their combinations or results, to able
to assign to each of them, its due share in bringing about the particular weather of any period, day or week. And yet no doubt, these are causes in operation, I produce if give a character to, every state or change of state in the weather; such are atmospheric currents; trade winds; seasonal currents, such as the monsoons; the diurnal alternations of land and sea breezes; not to speak of the whole host of variable winds, that cannot be attributed to any particular or general cause; all these must be considered as important elements, in determining the constitution of the weather. How much more then, is the difficulty increased, in attempting to determine, what elements may be in operation in the atmosphere, to act as to many causes of predisposition to epidemic disease.

If Prout says "the atmosphere contains a little of everything that is capable of assuming the parasitic shape" can we be at any loss to account for the numerous elements, that in co-operation may render our bodies susceptible of the first indications of disease.

(2) Physical influences. It must be ob-

forned in opposition to the opinion of a change
of the physical properties of the atmosphere, being the
cause of predisposition to epidemics, that there are
countries, where formerly the plague seems to have
rarely or never appeared, where it is now, a very fre-
guent visitant. Pestilential disorders are also
more frequent in Europe in former times. Consid-
ering these circumstances, it can scarcely be supposed
without a considerable latitude of imagination
that the atmosphere, over any of those places, has
undergone an alteration in its physical qualities,
or in the chemical combination of its principles,
so as to render it capable of being the cause of pestilens
of any kind, or of preventing it. We know by ex-
periments on the analysis of the atmosphere, that
the air of Africa does not differ in its physical
or chemical properties, from that of the most
salubrious climate of Europe. As this was demon-
strated, even when the plague prevailed in that
country. Moreover if we admit such changes in
the physical constitution of the atmosphere, we are
still at a loss to account for the local or partial
distribution of epidemics; so that the cause of any
epidemic, attributed to some atmospheric change
depended on the supposed malignant qualities

Gustoldi de avvelenda et profugando pesti. p. 119.
of the atmosphere, it ought to have been more prevalent of its distribution. Numerous instances might be brought forward, all tending to prove that it is impossible that pestilence should be occasioned by any particular condition in the natural pro-
duction of the atmosphere. Instances, placed in a direct relation with, or in the vicinity of others, when the disease has prevailed, have been observed to escape it altogether, or in situations too, whereby conductivity of other local circumstances, the state of the atmo-
sphere, must have been alike in all of them.

Mead says, that when the plague was last in England, while it raged in the town of Cambridge, the college remained free from it by keeping apart from the town; people. The
grapes Crevandal, who observed, that in a plague at Rome, in 1656-7, the monasteries generally for the most part defended themselves by using the same proceeding.

The same holds good, with regard to cholera. It was equally independent of atmospheric vicissitudes, if those laws regulate the con-
stitution of phenomena of the atmosphere; it was accompanied by no change in the chemical

The following winter, the plague a second time attacked the Athenians, having indeed never entirely left them, though there had been some abatement of it.
nature of the air. It showed itself independent of all atmospheric influences, whether of humidity, or rarefaction.

(B) Electrical influences as a Cause of predisposition. No one however, has been able to show that there is any such parallelism, between the electric and the choleric records, from day to day, as to justify the notion of there being any essential relation between them.

(Y) Seasonal influences. We must next consider the importance of some facts, regarding season, as a Cause of predisposition to cholera. And first with regard to Cholera. It is generally believed that it appears chiefly in the summer months; but as far as season is concerned, it travelled in all seasons. It spread with, or in opposition to the winds, and resisted during the prevalence of winds from all quarters.

The second time the plague is reported there broken out in Athens, it was in the beginning of Winter; Thucydides observes, that it proved so fatal, that in a very short time the whole city,
It lasted the second time not less than a year, the former attack having lasted two, so that nothing reduced the power of the Athenians more than this.

For not less than 4,400 heavy-armed, in the ranks, died of it, 1,300 of the Iphicletian order, with a number of the multitude, that was never ascertained.
A 300 cavalry was cut off by it, with a proportionate number of the inhabitants. Guizot de Chavannes, gives the history of a memorable plague, that prevailed the whole globe, in 1848. It destroyed 3 parts of its inhabitants; neither was it stopped by the different seasons or changes of the weather. Guizot also mentions an instance of a plague having invaded Aquitaine, in the middle of winter.

The same has been observed to break out in Europe, at every period of the year. It prevailed all over the Continent, in fact 1803, proved the most fatal. During the months of February and March, immediately succeeding.

In 1702, the same species of disease made its appearance in Britain. During the heat of summer, it raged most violently. When the temperature of the air was greatest. It hardly seems to be suggested, in addition to the above, that Small-pox, Measles & Scarlet Fever, have been epidemic, at all seasons of the year.

In connection with Cholera, in a visitation of that epidemic in 1829, the summer was extraordinarily cold; the
Visiter of 1829-30, in which cholera also raged was only unusual severity, all over the world. From these facts, any further observations, tending to elucidate this point appear unnecessary. It can hardly be supposed, that the changes which the atmosphere undergoes, in the vicissitudes of seasons, will be capable of producing one common defined manner affecting mankind generally. The nature of every region, whose constitutions & habits are equally diversified.

(A) Topographical influences. Under this head, it also include climatological influences. They have been occasionally perceived, an over-proportion of the natural constituent parts of the atmosphere itself, in certain situations, near to sources, where they are evolved. Temporary changes in the state of the atmosphere, have a most powerful effect in modifying the malignancy of prevailing diseases, whether these be endemic or epidemic, thus contagious spread more rapidly at certain times, even in the most temperate climates. Typhus, Small-Pox, &c are observed to become more active in a dull foggy state of the weather; on the
contrary, their progress is less rapid, when the atmosphere is warm, dry. Every writer on
plague has remarked an apparition
in its symptoms with a proportionate evid-
ence in its contagion, about the time of full
moon; probably by an attentive obser-
vation, this may be found to be the case,
during the appearance of very acute
disorder. Nevertheless, according to the
type, with which we set out, namely Cholera,
its propagation has always been wide-
spread by terrestrial influence; for it
existed, when the gasous exhalations,
could not have been the same; it re-
sponded its baneful influence, from month to
domestic or wild. From ill-ventilated towns, to
dwellers. From ill-ventilated towns, to
the hut on the mountain; in fact it was
quite independent of geographical or local
position.

Again epidemic diseases have broken
out in many instances, independently
of any particular local spot. Former
plagues, of an epidemic character,
show this; thus the great epidemic plague,
in the reign of Edward III. broke out almost simultaneously, all over Europe.

The great Plague of London also, broke out in several places, simultaneously; as the Plague of Rome, in the year 287, came on quite suddenly, and as suddenly disappeared.

Such then are some of the reasons to the objections that might be raised regarding the unascertained causes of predisposition to epidemic diseases. Some of the statements brought forward, in the present state of our knowledge, are nearly, if not wholly hypothetical; therefore no positive theories could be grounded on them. In thus attempting to offer a few hints, illustrative of some of the phenomena of the atmosphere, considered as to many causes of predisposition, I have merely mentioned those which appeared to me to have very direct bearing upon the subject. Though the subject is perhaps one of the most interesting in connexion with the economy of our earth, it is at the same time, as difficult as any, that could engage our
inquiring in endeavours to lay the causes. In some epidemic constellations, we are most
begging the question. I only exposing our own
ignorance. In the present state of science, we
can only admit the actual facts: (as before it
seemed) the data we possess on these uncontrolled
causes, are too few to admit your generalizing them,
in order to frame a theory. Let us always remember
that our theories must now be subject to change, in
proportion as our knowledge advances; that that
we must seek for, that rigidly, our correct facts.
In the limited knowledge of which we possess, we must
over hold difficulties, if we cannot explain
apparent inconsistencies. If we cannot reconcile; in the meantime, let us content
ourselves with the collection of these
isolated facts.
Conclusion.
Such then are some of the examples which can be selected of the many causes which are at work, in keeping our constitutions open to the attacks of disease.

The words thus bequeathed, one of the greatest practical worth; they seem to show us that in many cases, the remedy lies within our own reach; that until we have succeeded in avoiding or reducing the many sources of malady, we can never reflect or hope to attain anything like exemption from premature death.

Many of the maladies already enumerated which yearly commit such deadly havoc, are of a description, which we must all agree in declaring to be capable of removal, or at least ameliorable, by the enforcement of vigorous, judicious, and liberal means of sanitation; a large proportion of deaths we have already seen, are owing to recklessness, riot, intercourse, evils which it may be said, are even harder to cope with, than the extremes of either torrid or rigorous damp, or the malarious miasmata, of an en-
healthy country; but evils of the same time, which are not beyond control. Some of the incidental causes already enumerated, may appear trivial; yet the least of them, may be developed into results of great public importance. It is calculated, that 100,000 persons die annually in England alone, from preventible disease.

From such a retrospect then, I write such dark pictures of the past before us, we cannot but feel, that vast difficulties, many disappointments, must attend the future work; if all those who may be engaged in the duty of sanitary reforms, but at the same time, we cannot look forward to the future, without lively hope; indicate cardiacus as the labour appears, it is visited by; flames of hope. Encouragement at every step; cold oneself, indeed must be the heart, that does not recognize in these very evils, the great advantage to be gained, by a due attention to sanitary precautions & regulations. The evil so far is susceptible of remedy. I may even be said, to be
on the decline. The question for the practical medical man is "can I by any means reach these causes?" I've heard that all the intellect that science can afford, all these applications of modern skill, which discover new curative agents. The questions which it is the glory of science to solve, are always of intense interest to the philosophic physician.

In obedience to the Almighty first, death the Healer of the human being, still shall continue to jostle his triumph. Death must always reign; it knows equally "in tabernas...parfumum, tumes regnum" or the cellars of the poor, the castles of royalty: although we can never expect to banish it, still the rate of the percentage of deaths can be checked, the disease be mitigated, by hygienic measures. I know the medical man can succeed in carrying into operation, any one single established hygienic law. He may be said to respect, one of the greatest gifts, imparted by the Almighty to man—the power of-uniting death. This no doubt is a task, which we all...
took to elucidate, when we assuage ourselves
the ability, to ward off the stroke of death, I
reassert to our fellow-creatures, the bless-
ing of health.

If then I have succeeded in ex-
pounding, in bringing forward illustrations of
the various causes of predisposition to chronic
disease, which have operated, which may
be expected again to operate (for though slow
in action, yet are they no less sure); if I
have so treated of this vast and important
topic, as to furnish an encouraging incentive
to those already engaged in the same field
of inquiry; if I have shown them, that succ-
cess we may anticipate, in the smaller
amount of mortality, from such palpable
causes, I shall then feel, that I have ac-
complished a purpose, not less important
for its own sake, than because of its indi-
crect relation to other points of even
greater moment, in the department of
Medical Science.

But it must be Utopian indeed,
who can ever seriously entertain a hope,
that a time may come, when the necessity of Prevention shall be done away with.
In the meantime, let us be content with the proverbial, though no less important truth, that
"Prevention is better than Cure."

Chas. W. Carter Madden
March 31st, 1859.
Addenda

It is one of the most curious and interesting discoveries of modern meteorology, that there are tides in the air, as in the ocean. As the atmosphere is a fluid, as well as the ocean, the sun and moon must have similar tendencies to produce tides in it. As it is a lighter and more mobile fluid, it reaches to a great elevation above the summits of the highest lands. These atmospheric tides, considered merely as results of precipitation, must be much more extensive, and occasion more disturbance in its mass, than the tides of the ocean. These atmospheric tides appear to be of two kinds: the first being the result of the heat of the sun's rays; the second being due to the attraction of the moon. The atmosphere is heated to some extent by the transmission of the heat-rays from the sun through it, but chiefly by radiation in contact with the earth heated by the sun. What effect have these currents of the atmosphere may have, in being considered causes of predisposition to epidemic disease, it is very difficult to ascertain. Perhaps they may have some effect in
determining seasonal differences? For instance, it is a fact pretty well established, that in the northern hemisphere, the countries on the western shores of the two great oceans, have their Winter & Summer, running more into extremes, than those of the countries on the eastern shores of the same. These atmospheric currents then, by acting on the seasons, & in their turn, indirectly contribute to the origin, it may be the result of an epidemic, may be considered. Causes of Pre-disposition, that is to say, that the currents of the atmosphere may transfer, for instance into high latitudes, a degree of tropical heat. Of humidity, derived from tropical evaporation, that shall render the comparative temperature of the Summer & Winter, greater than that of the mean annual temperature; thus rendering the seasons, much more extreme in their contrast; both the heat of Summer & the cold of Winter, being far more intense. If then these seasonal differences, consist more on an alternation of drought or humidity, than in one of more heat or cold, we have in them very influence
another cause of Predisposition.
the equilibrium of the temperature, of the functions of the skin, thereby preventing that disengagement of the bowels, which is so frequent a consequence of cold applied to the surface.
of those in them, who had provided themselves with flannel, of those who had not. The list of sick & dead, always included names from the latter list in a very great proportion. Sir J. Rennie says to Rodgler, who accompanied our army into the north, at the time of the Rebellion, relates that the health of the soldiers was greatly promoted, by their wearing flannel waistcoats, with which they had been supplied, on their march, by some Society of Friends," & Sir J. Ballingall, in his Lectures on Military Surgery, page 92, addresses the destruction of Sir James Macgregor, is the statement that, in the Peninsula, the best clothed regiments were generally the most healthy; adding that when in India, he witnessed a remarkable proof of the usefulness of flannel in checking the progress of the most approved forms of dysentery, in the 2d Battalion of the Royals. Capt. McNair, told D. Cruikshank, that he was so strongly impressed from former experience, with a sense of the efficacy of the protection afforded by the constant use of flannel, that when on his arrival in England, in Oct. 1823, after 2 years service amidst the ice, &c., on the coast of Labrador, the ship was ordered to sail immediately for the W. Indies, he ordered the purser to draw 2 extra flannel blankets, Chair of drawers for each man, & instituted a regular daily inspection, to see that they were worn. These proceedings were followed by the happiest results. He proceeded to
that men living on salted meat, or on a deficiency of fresh vegetables, be free from any scrobutic taint. It is owing to the salt-pork and biscuit that many of these scrobutic youth die.

If bad food be found productive of evil consequences, polluted water is quite as much so.

In many cases the supply of water becomes very deficient or insufficient; owing frequently to the absence of fresh lakes or the existence of salt lakes, the water becomes quite brackish, and has a fungicid effect. It is almost appear unnecessary to furnish cases as proofs of the doctrine, that foul and polluted water, whether used as drink, or as aiding the addiction of diffusion of mutagenic elements, do become the vehicles by which the seeds of death are carried into the system. The awful prevalence of the epidemic in Paris, in 1832, was attributed to the circumstance, that at that time four-fifths of the water of that city, was taken from the Canal de L'Ourcq. It was appropriated to the navigation of boats and vessels. Its water may become unwholesome, may almost poisonous. From satiation with decaying vegetable matter, it do become a paramount duty.